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Governance of Interlocal Government for Water Supply System in Indonesia

by

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B.Sc. in Engineering, 2001
M.Sc. in Urban Development Studies, 2007

A dissertation submitted in partial satisfaction of the
requirements for the degree of
Doctor of Philosophy in Engineering

in the

GRADUATE SCHOOL OF ENGINEERING
DEPARTMENT OF URBAN MANAGEMENT
of
KYOTO UNIVERSITY

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Mangapul Lammiahan Nababan

Abstract

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Mangapul Lammiahan Nababan

Doctor of Philosophy in Engineering in

Kyoto University

One of the global agenda in Millenium Development Goals (MDGs) is to achieve halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation (Target 7c). Data of current achievement shows that slow im- provement in water supply system is due to the low development as well as investment in this sector especially in cities. Bird et.al (2008) in Ari (2011) emphashized that potential water crisis in Asian countries especially in developing countries may not because of natural water scarcity but rather because of inadequate or inapropriate water governance. After decentralization, local governments play more important role in water governance. However, transition from very centralized country to becoming decentralized tends to lead local governments to several chalenges that related to budget issues, and the obligation to provide sufficient local public goods to its residents.

This condition has foced local governments to search for alternative source of infrastructure financing such as PPP. However, there is a potential to establish cooperation to other local governments that could lead to provide water supply provision in a more efficient way. This thesis aims to develop models that could explain that partial authority as one of condition of asymmetric ownership od water supply provision in decentralization, is an important factor that lead to inefficiency of water supply system provision. We develop model based on asymmetric ownership issues that emerging in Bandung Region in Indonesia, particularly involving bandung Regency and Cimahi City local governments.

In a brief manner, we summarize every chapters in this dissertation as follows. Chapter 1 of this dissertation explains the background of the research, research objectives, rationale of teh research as well as research methodologies used. In this chapter we explain our motivation to conduct this research, the results and findings, as well as the novelty of our research. Final subsection of the chapter describes the structure of dissertation.

Chapter 2 investigates the current condition of water supply system provision in Indonesia. We start from elaborating of water management and water policy in Indonensia and discuss implication of decentralization policy to water governance. We emphasize the role of local governments and issues related to fragmented jurisdiction, and interjurisdictions provision of water supply system.

In order to develop a more undertanding of current condition, we take a study case of water supply system provision in Bandung region, in which we expalin more detail about access to clean water in Bandung region and Cimahi City. Further we explain the profile of PDAM Tirta Raharja, in which we found that there is an asymmetric ownership issues in the management of the PDAM. As an attempt to formulate problem statements that explaining the phenomena, we also describe the result of interview that we conduct with several key persons involved both from the PDAM Tirta Raharja side and Cimahi City side as well. Final section of chapter 2 discussed the concept cooperation between local governments, its benefits, challenges as well as the difficulties facing local governments to establish institution that deal with cooperation issues.

Chapter 3 describes basic theories that related to the research topic. We conduct literature review of works of researchers that mainly from the theoretical views of public economics and literature related to decentralization and governance. We emphasized literature related to theory of public goods which the basic of theories on local public goods provision. Further we investigates papers on implementation of decentralization policy in many countries, and discuss literature on interjurisdictional cooperation such as interlocal government cooperation and its difficulties.

Chapter 4, explains the process of developing the model. First, based on the previous chapters in where the current condition of water supply system provision explained, we developed the basic framework of the model. According to the clarification process that resulted from data collection and interview process, we formulated the problem and develop the basic model theoretically. In the model we emphasized cost for water aquisitition between local governments especially incorporating the case comparison between of impartial and partial authorithy allocation.

Regarding the nature of condition of Indonesia, partucularly Bandung region, we incorporate fluctuated demand issues of water supply system provision into our model and with the similiar manner we show its implication to cost of water acquisition and the profit of PDAM, as well as comparison between impartial and partial authorithy allocation settings. Further we

discuss the externalities that shown in the model and policy implication of the model to both Bandung Regency and Cimahi City. Final section of the chapter discusses the conclusion of the model, its policy implication and the topics of future research related to possibility in extending the model in the future.

Chapter 5 concludes our research and proposes future research topics.

To my parents, my wife Friska and my children Mikhalehon and Hannah.

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I am also very thankful to Dr. Ibnu Syabri, Dr. Miming Miharja and Dr. Sri Maryati from School of Architecture, Planning and Policy Development ITB, Bandung for their kindness to help us in arranging interviews with key persons of stakeholders related to my research.

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Symbols

Abbreviations

ASEAN	Association of Southeast Asian Nations
ADB	Asian Development Bank
BMA	*Bandung Metropolitan Area* or Bandung Greater Area
BPS	*Biro Pusat Statistik* (Central Bureau of Statistics)
Bappenas	*Badan Perencanaan Pembangunan Nasional* - National Development Planning Agency
Bapeda	*Badan Perencanaan Daerah* - Regional Planning Development Agency
BUMN	*Badan Usaha Milik Negara* (state-owned company)
BUMD	*Badan Usaha Milik Negara* (Regional-owned company, Local Enterprise)
EHRA	Environmental Health Risk Assessment
GRDP	Growth Regional Domestic Product
HDI	Human Development Index
IDR	Indonesian Currency: 1 ¥ ≈ 110 IDR
JA	Joint Agreement
LOS	Level of Service
LPG	Local Public Goods
MDGs	Millenium Development Goals
MPW	Ministry of Public Works
MoU	Memorandum of Understanding
NRW	Non Revenue Water
PAMSIMAS	*Penyediaan Air Minum dan Sanitasi Berbasis Masyarakat* (Community -Based Water Supply System and Sanitation Provision)
PDAM	*Perusahaan daerah Air Minum* (Local Enterprise for WSS Provision) PDAM Tirta Raharja-Tirta Raharja Local Enterprise for WSS Provision, in Bandung Regency
PJT	*Perum Jasa Tirta* (state-owned enterprise responsible for supplying raw water)
PPP	Public Private Partnership
PAD	*Pendapatan Asli Daerah* (Regional Income)
SR	*Sambungan Rumah* (House Connections)
TVA	Tennessee Valey Authority
UFW	Unaccounted for Water

UN	United Nations
UNDP	United Nations Development Programme
UN-WWAP	The United Nations World Water Development
WSS	Water Supply System

Chapter 1

Introduction

1.1 Backgrounds

Water is fundamental for improving life quality and welfare of expanding population particularly in urban areas. The United Nations has stated that access to safe water is one of the human rights (UN-WWAP, 2003), and this is facing the condition where almost one-sixth of world populaton doesn't receive safe water, that lead to estimation that stated approximately 6,000 people die every day from water-related illnesses (Gilbert, 2006).

One of the global agenda in Millenium Development Goals (MDGs) is to achieve halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation (Target 7c). This target has been elaborated by Government of Indonesia to achieve 75.29% in urban areas and 65.81% in rural areas (BPS, 2010). According to this current condition which are 49.82% and 45/72% both in urban and rural area respectively, Government of Indonesia has marked those target with a critical note "'need special attention" (Report of MDGs 2010, Bappenas). Following this condition, Bappenas also highlighted that generally access to water supply system, usually provided by PDAM tends to be higher for households in urban areas rather than in rural areas. Data of current achievement shows that slow improvement in water supply system is due to the low development as well as investment in this sector especially in cities. Another issues are poor maintenance and management of institution of water supply system provision.

Bird et.al (2008) in Ari (2011)(6) emphashized that potential water crisis in Asian countries especially in developing countries may not because of natural water scarcity but rather because of inadequate or inapropriate water governance. In order to fill the gap in water supply system provision, rural areas in Indonesia rely on community based water supply system or

else traditional ways such as private well, spring, river or rainfall water. Generally, Indonesian Government has attempted to improve people access to safe water, however there are also many reports on insufficient water supply provision.

When an adequate water service is unavailable or people can not afford the water price, alternatives of water source should be provided. Water has been comodity around the world and Gilbert(2006) describes such a condition in this following sentences

> *In any case, water has long been a commodity in most cities around the globe. In Latin America, most water companies originated under private ownership and, therefore, piped water always came at a price (Gilbert, 1998). When municipalisation and public ownership took over from less than competent private managers, charging for water never disappeared. Public utilities might have priced water too cheaply, or never got round to collecting the payments, but the principle of charging was rarely, if ever, questioned (Gilbert and Ward, 1985). Later, when public utilities in the rapidly growing cities of the South failed to keep up with the growth of demand, a different form of commodification took placesmall private operators entered the market to supply the poor (Crane, 1994; Fass, 1978; Gilbert, 1992; Solo, 1999; Nickson, 2001). Privatised tankers and informal companies sold water to the poor, usually at many times the price of water from a tap (Damian, 1992, p. 35; UN-Habitat, 2003, pp. 6972).*

Those conditions mentioned above also exist in most part of Indonesia. Some researches have been conducted to discuss water supply provision in metropolitan cities and one of them was a research on PDAM Jakarta by Crane (1994)(25) who discussed how people in Jakarta received water from many ways such as PDAM, street vendors, stand pipes and private wells. It has been proven that the quality of water from private wells in urban areas is doubtful and eventhough inexpensive but nowadays this source of water increasingly contaminated.

In relatively rural area, current research on community based water supply system in one rural area in Indonesia has been conducted by interested scholars, among them by Ari (2011) (6) who discussed community based water supply system in Malang Regency, East Java. Other researches on management of PDAM as well as its feasibility in implementation of PPP (Public Private Partnership) can be found in many literatures as well as reports.

To provide water and sanitation according to MDGs goals, it has been estimated that it required $ 30 billion a year, a number which was criticized by *The Economist* in 2006 questioning about who should pay the provision cost and who should administer the service. The answer can be scrutinized where in current condition of democratization and decentralization of Indonesia, for instance, the answer is obvious, local governments.

As recently many Asian countries political paradigms have turned to decentralized system, including Indonesia, the role of local governments in promoting access to safe and

clean water with improved piped water becomes very important particularly in urban areas. However, transition process from centralized to decentralized has implied to emerging issues on local government capacities in providing local public goods. Lack of local budget, adaptation to new beureucracy system as well as political process in local level,somehow, influence urban infrastructure improvement. For many local governments, for instance, PPP might be one option, however such issues on feasibility, and lack of water sources due to geographical condition has been emerging issues currently in terms of attracting new investors.

Our main focus in this research is associated with relationship between local governments. To illustrate such condition, let us take an example, where there is one local region who might have abundant water resources while its neighbor region suffers water scarcity. In this case, there is possibility to cooperate each other. Neverthless, inspite of for the last few decades scholars has paid attention in the management of water supply system provision in metropolitan areas, only few research has been conducted on how local governments attempt to cooperate for water supply system provision.So that, in our research, we focus on how local governments establish cooperation in public good provision to achieve scale of economies, social welfare and efficiency. In addition to that, we listed emerging issues which are still needed to be discussed more between local governments such as cost allocation, joint production and the attempt to maximize their respective local residents utility.

1.2 Objectives of the Research

In this research we are dealing with decentralization process in Indonesia and its implication to the provision of water supply system in local level. Our main objectives are:

1. To investigate implication of decentralization to the change of water governance in Indonesia. We particularly emphasize issues on water right and water supply provision by local government in fragmented jurisdictions and regional autonomy condition. We take a case of water supply system provision in Bandung Regency and Cimahi City, 2 local governments that are involed in PDAM Tirta Raharja provision, as a background example.

2. To formulate problem statement absed on data and information collected from secondary survey and to clarify the problem by conducting interviews with keypersons in both regions.

3. To develop theoretical model associated with the issues emerging in both of regions in order to explain problem statement as well as proposeing expected solutions

4. To discuss policy implication of the model and propose scenarios of solution in economic point of view

1.3 Rationale of the Research

Many countries, especially developing countries, have turned to change their government system to decentralized. Many democratics countries believe that tranfer authorities from central government to lower level of government as a means to gain efficiency in the governance process, and by generating more independent local government in terms of increase their capacity to treat their residents in more responsible ways. Neverthless, local government, in the process to becoming more mature government, are facing a transition process, in termes of they have to be accustomed to condition where dependency to central government decreased. In terms of the lack of budget in infrastructure provision, nowadays local government should find ways of funding sources.

This condition has led to motivate us to propose establishing cooperation between local governments to achive efficiency and reduce cost of public godd provision for instance. In academic ponit of view, this research can be considered as one appropriate contribution for explaining water supply provision involving local governments in decentralization era where such framework can be adopt to be implemented in other similar setting.

We found that this research distinguishes among other researchers' works particularly in how it incorporates water supply system provision between local governments in decentralization setting. Another thing is its attempt to develop theoretical model from economics point of view that can be considered as a contribution to the field of public economics particularly in local public good provision theory.

1.4 Research Methods

Methods used for this research can be explained as follows. First, we investigate the problem based on issues we obtain from a case in PDAM Tirta Raharja, where there are 2 municipalities involve, Bandung Regency and Cimahi City. Second, we collect information as well as conducting interview to clarify our hipothetical problem statement. Further we conduct literature review to understand the concept from theoretical point of view and as well as to survey related works in the similiar topic.

Based on such assumptions, we develop economic model to describe the setting of 2

local governments involve in interlocal government cooperation where we solve the problem by proposing cost allocation rule among respective agents and exploring the condition facing local governments in terms of difficulties of institution arrangements as well as regional characteristics. At the end we formulate policy implication of the model and propose solutions to be considered by policy makers.

1.5 Contribution of the Research

The research attempts to be one contribution of application economics theory, particularly public economics into literature of infrastructure management, particularly water supply system provision management. Our motivation to conduct the research can be considered as an attempt to incorporate multidisciplinary approach to resolve problem of infrastructure provision in developing country. One of important points in the research is concern of the problem emerges in infrastructure development are not necessarily only related to technical or funding issues, but rather related to political and governance system issues. Common conditions in developing countries emerge due to the change of governance system that implies infrastructure development process is motivation to conduct the research.

The research take a different view of approaching the problem due to its emphasizing in the case local governments in Indonesia where problems of public good provision are influenced by political as well as governance issues. Here we attempt to answer why local governments play important role in water supply system provision particularly in a setting of provision involving interjurisdictions. To answer the question we begin from investigating the real case in Bandung region in order to help understanding the concept based on reality, survey literature review on related research, develop the model and proposed policy implication. Finally conclusion and recommendation are proposed in order to contribute for resolving the problem of water supply system provision in Bandung region.

1.6 Structure of the Dissertation

The dissertation is organized as follows. Chapter two describes the current condition of location of study where we explain the background of water resources and water governance in Indonesia, in which we emphasize issues on water supply system provision Bandung regency and Cimahi city. We also emphasize the case of asymmetric ownership in PDAM Tirta Raharja as the basic framework for developing our model. Chapter 3 investigates literature review on

public economics particularly public goods, club goods that lead current works on local public goods research. We also introduced the concept of cooperation between local governments and discuss the difiiculties to establish cooperation in which we investigates several pattern of cooperation that could be implement in resolving a setting of 2 local governments. Chapter 4 shows the process of developing the model of partial authority between local governments, where we discuss cost allocation rule involving integrated municipalities and incorporating possible settings. Chapter 5 concludes our research and proposes some potential future research topics.

Chapter 2

Water Supply System Provision in Indonesia and the Role of Local Governments

2.1 Introduction

One of the global agenda in Millenium Development Goals (MDGs) is to achieve halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation (Target 7c). This target has been elaborated by Government of Indonesia to achieve 75.29 % in urban areas and 65.81% in rural areas (BPS, 2010). According to this current condition which are 49.82% and 45.72% both in urban and rural area respectively, Government of Indonesia has marked those target with a critical note "need special attention" (Report of MDGs 2010, Bappenas). Following this condi tion, Indonesian Government also highlighted that generally access to water supply system, usually provided by PDAM tends to be higher for households in urban areas rather than in rural areas. Data of current achievement shows that slow improvement in water supply system is due to the low development as well as investment in this sector especially in cities. Another issues are poor maintenance and management of institution of water supply system provision.

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As recently many Asian countries political paradigms have turned to decentralized system, including Indonesia, the role of local governments in promoting access to safe and clean water with improved piped water become very important particularly in urban areas. However, transition process from centralized to decentralized has implied to emerging issues on local government capacities in providing local public goods. Lack of local budget, adaptation to new beureucracy system as well as political process in local level, somehow, influence urban infrastructure improvement. Several local governments, attempt to propose PPP project as one option in water supply provision, however such issues on feasibility, and lack of water sources due to geographical condition have been emerging issues currently in terms of attracting new investors.

In this chapter, we investigate how neighbor local governments provide water supply system where asymmetric ownership exists. Asymmetric ownership here can be regarded as one implication of decentralization process where new autonomous regions formed and some of regional assets such as local enterprise asset remains under interjurisdictions management. We will take PDAM Tirta Raharja (local enterprise in water supply system provision), in Bandung Regency and Cimahi City, West Java Province Indonesia as an example. By understanding such conditions in the study area, we formulate appropriate problem statements facing those 2 local governments and discuss appropriate solution concepts as remedies.

This chapter is structured as follows. Section 2.2 describes water management and water supply system policy in Indonesia after decentralization. We mainly discuss the decentralization process and its implication to Indonesian governance particularly on water management and water rights. Then we summarize the current condition of water management and water allocation in Indonesia, particularly post decentralization era begun from 1999, in which formation of new autonomous regions has led to change of water management geographically. Section 2.3 shows brief description of our study area in Bandung regency and Cimahi City, in which we explain how residents in both regions access to clean water. Section 2.4 explores the profile of PDAM Tirta Raharja and investigates issues obtained from data collection and synthesizes clarification based on result of interview with manager of PDAM Tirta Raharja, Bandung Regency, policy maker in Cimahi City. In section 2.3 and 2,4 we focus on the case of PDAM Tirta Raharja in Bandung region, a local enterprise for water supply system provision, under authority of Bandung Regency Local Government which is interesting due to its emerging issues on asymmetric ownership involving 2 neighboring local governments, Bandung Regency and

Cimahi City in West Java Province. Based on the setting, in section 2.5 we formulate problem statements in which we also discuss interlocal government cooperation where in the provision of PDAM Tirta Raharja and introdude expected solutions to resolve such problems. Section 2.6 concludes the chapter and proposed potantial future topics.

2.2 Water Management and Water Policy in Indonesia

Growing population, especially in urban areas also lead to increasing demand of adequate clean water thus requires efficient provision of the valuable economic resource. Emphasizing the need of domestic uses to clean water, in 2025 world's populations is expected to be grown to eight billion and by the year of 2000 much of the population growth will be concentrated in urban areas. Currently, approximately 1 billion people in developing countries do not have access to clean water, and this condition also lead to people high consumption of contaminated water with emerging risk due to unsafe water.

Water supply system provision is part of water management that requires careful treatment from society. Due to its importance and lack of ability of private sector, mostly provision of water supply system in many countries are considered as public sector. This usually resulted in inefficiency issues as well as quality and reability of water. Some country, for instance, Indonesia attempted to solve such kind of problem in public sector with decentralization of water management. However, eventhough it could not solve the problem completely, decentralization has been believed improves the efficiency of water allocation (Easter& Hearne, 1995)(**?**).

Technically, there are 2 major issues on water supply system management which are explained by Hadad (2003)(35) as follows:

1. Non-availability of raw water has been another common problem facing operators, especially during the dry season (April-October). It was reported that Java Island, Indonesia's most populated island, experiences around 13 billion m^3 of water deficit every year. This has led the government to alleviate millions of people and farmers impacted by the drought via a variety of supporting schemes including: free rice support, re-forestation projects, and designing less water-dependent agriculture systems (Hadad, 2003).

2. Low water quality has also become a serious problem. In 2006, Perum Jasa Tirta (PJT), a state-owned enterprise responsible for supplying raw water to Jakarta area, warned that raw-water supplies cannot be guaranteed throughout the year due to water contamination. Based on a recent UN report on clean water conditions worldwide, and the data presented

on 16-23 March 2003 in Kyoto (Japan), the Indonesian water quality was ranked at a very low level (i.e. ranked 110 out of 122 listed countries) (Hadad, 2003). This simply means pollution, disposal systems and sanitation are at appalling rates.

According to Law No. 7/2003 (in LM-FE, Unpad, 2008)(89) there are principles should be considered in order to obtain optimal and sustainable management and utilization of water resources, which are:

1. Water resources have social and ecological functions, and economic value. It is utilized as much as possible for people prosperity, and to maintain national unity and resistance.

2. Utilization of water resources is integrally, comprehensively, sustainable, environmental broad-mindedly planned. It is conducted through river area approach, and implemented based on decentralized government system in accordance with comprehensive and responsible local autonomy

3. Utilization of water resources is based on the principles of conservation, utilization, fairness, independence (business feasibility) and accountability.

4. Community is gradually obliged to be responsible for water resources utilization cost (directly or indirectly) based on cost recovery principle.

5. Community is involved in making decision through Water Resources Consultation Forum in all aspects of activity (planning, implementation, control, management and funding)

6. Utilization of Water Resources is given the highest priority to a strategic river for economic development, national unity and resistance by considering the level of socio-economic development, demand of fulfilling needs, and water availability and utility.

7. River area management is conducted as much as possible by establishing corporation maximizing potentials of state-owned company (BUMN), local government-owned company (BUMD), private company and cooperative.

8. State-owned company (BUMN)/local government-owned company (BUMD) is established in a river area in which its dominant user is capable of paying contribution.

9. To guarantee an optimal utilization and conservation of Water Resources, there should be management concentrations related to Water resources management, as follows: (i)Rain Caught Area Management;(2)Water Supply Management;(iii) ;(iv)Water Quality/Water

Pollution Control Management;(v) Flood Control Management; (vi)River Environmental Management; and (vii)Irrigation Infrastructure Management.

Those principles above also shall not be separated from implementation to water supply system provision in urban and rural area. Implicitly, the Law of Water Resources has opened participation of many stakeholders to contribute to water resources management. regarding water supply system provision, those principles are inline with the establishment of PDAMs in many regions that invoving participation of private sectors. This is also a breakthrough for implementing Public Private Partnership (PPP) as alternative schemes of water supply system provision.

One of comprehensive discussions on water markets problems in Indonesian metropolitan cities is the paper by Crane (1994)(25). He investigated the trend of water supply system development by taking Jakarta City as a study case. He highlighted that the development of in-house connections network of water supply system provided by PDAM has been in progress, but he also pesimistically added that such process will take several decades which is proven today due to the current condition of Indonesia. Most of the residents in Indonesia's big cities such as Jakarta, Bandung, Surabaya, do not have direct access to piped water. Residents still struggle to find traditional ways in obtaining low-cost water sources even though they realized that it has been contaminated or even deplected (Crane, 1994). Other groups of residents obtain water from other alternatives sources like water vendors, and shared neighborhood stand pipes. These alternatives neverthless are very risky both due to water quality issues and its expensive price compare to pipelined water. In table 2.1 which shows comparison of level of service of pipeline water system among several ASEAN cities, it can be seen that Jakarta City as capital of Indonesia has the lowest LOS of pipelined system among other ASEAN cities. UFW rate in forth column of the table means unaccounted for water. In Indonesian case, it is considered as leakage, both because of water stealing (illegal connections) and because of water leakage as results of deteriorated pipelines and poor maintenance.

In order to understand the water right and the role of local government in WSS provision, next subsections will describe regulation of water supply system management which imply to interjurisdictions authority of water management after decentralization. In addition to that we also show the general profile of PDAM Tirta Raharja.

Table 2.1: Comparison of LOS of water Pipelined System with ASEAN Cities

Cities	Consumption (l/cap/d)	LOS	UFW (%)
Jakarta	150	40	57
Kualalumpur	200	100	20
Singapore	183	100	8
Manila	202	55	50

Source: Bapekin, Ministry of PW, 2001

2.2.1 Indonesian Decentralization System

Following Reformasi occured in 1998, Indonesia turned to a new period so called Decentralization, where political power has been decentralized rapidly from central government to provincial and local authorities. One of the critical processes in this period is transfer of asset management from central government to local governments as ordered by Law 22/1999 on Local Government and Law 25/1999 on Intergovernmental Fiscal relationship and their revision in Law 32/2004 and Law 33/2004. After these Laws stipulation, decentralization waves emerged in every part of Indonesia and followed by formation of many new autonomous regions (more than 400 cities and regencies have been formed until moratorium policy in 2009). Neverthless, formation of new local authorities was not followed by mechanism in asset management sharing of public facilities involving two or more local regions eventhough the possibility of joint management/production or cooperation between respective local government is also regulated in the law.

According to Bird and Vaillancourt (1998)(16), we denote that decentralization that applied to governance system of Indonesia as *the transfer of significant degrees of authority and responsibility for governmental expenditures and revenues from central government to lower levels of government.* This system is considered has implied a significant change in Indonesian governance system. Since 1950s, Indonesia has been globally known as one of the biggest centralized countries, however after decentralization policy, hierarchical relationship between provincial governments and local governments has been eliminated. As a consequence, provincial governments remained a direct line with central government while local governments enjoy more independency. It is followed by transfer of various autonomous management from central government to local government including infrastructures. This system has newly introduced a relative limited role of provincial government which is more related to coordonation role for municipalities. The system even has been more stable, as according to Law 32/2004, Regency

Regents and City Mayors shall be elected by its residents in regional direct election process.

Another important law is Law No. 25/1999 that regulates Fiscal Balance of Central Government and the regions as well as revenue sharing from provincial and local governments. As consequences of this law, local governments now have revenue-raising power for generating income for infrastructure development. The Law only regulates revenue sharing of natural resource revenue with central governments where local regulation on tax instruments or distribution is delegated to be under authority of local governments. In some sense it is clear that local government should develop independent capacity to manage its own budget, later on local government is also facing options whether to compete or to cooperate with other local government.

Taking infrastructure development for example, in centralization period all budget proposals for local infrastructure development should have been approved by central government. After decentralization, as shown in Figure 3.1, regional budget for infrastructure development might come from several sources both from fiscal decentralization mechanism and regional revenues, among them are: local retribution, regional tax, regional obligation. Regarding infrastructure financing, participation to contribute may come from local enterprise, community and private sector. As consequence of the government system change, provincial governments remained a direct line with central government (even though Governors currently should be direct elected by the residents of the province), while local governments enjoy more independency. The change is also followed by the transfer of various autonomous management from central government to local government including, for instance, infrastructure management.

This system has newly introduced a relative limited role of provincial government which is now mainly focused to coordination role for inter municipalities, for example, management of river between municipalities, intermunicipality road etc. The system was even more stable, as due to Law 32/2004, Province Governors, Regency Regents and City Mayors shall be elected by its residents in regional direct election processes.

In order to fulfill local government obligation in water supply system provision (water provision is one of the main government obligation ordered by Constitution of Republic of Indonesia), a local government can arrange a cooperation with a third party, such as PDAM, this condition is regulated by Decree of Minister of Internal Affairs 43/2000. According to Government Regulation No. 14/1987, water supply system particularly in urban areas, are provided by PDAM by semi-autonomous joint managemenbt where local government owned shares partially.

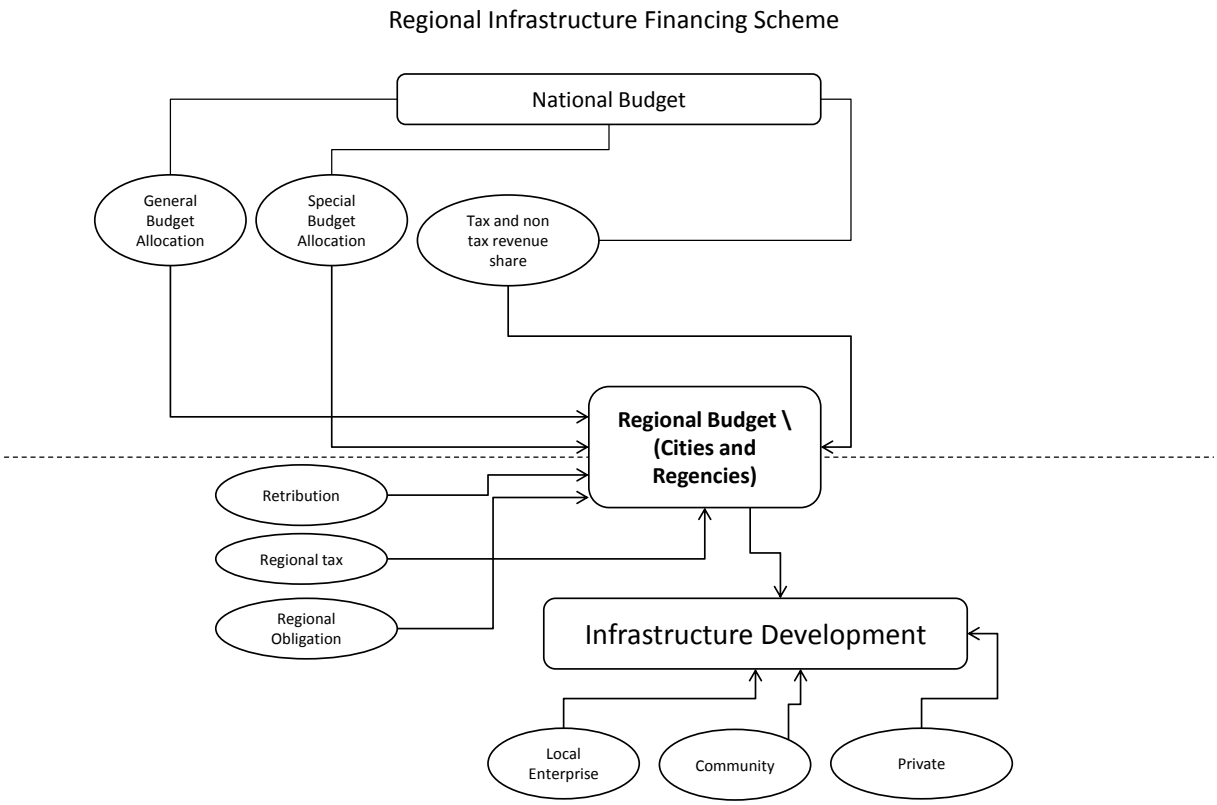


Figure 2.1: Regional Infrastructure Financing Scheme

In order to accelerate improvement of water supply service, few decades ago, Indonesiaon has started to support local government for inviting foreign investment in PDAMs. The privatizations has been applied to several PDAMs such as PDAM Jakarta with PAM Lyonaisse(Palyja- a French investor) and Thames PAM Jaya (British), PDAM Sidoarjo with Vivendi (French), PDAM Manado with Cascal BV(Dutch) and PDAM Batam with Biwater (British). However, the process of privatization to other PDAMs is still on going as well as facing cliche issues such as feasibility, risk management as well as political constraint related to tariff policy in local governments. In order to implement privatization in water supply system, local government preparing PDAM and maintain the business by making supporting policies on level of service as well as price. In addition to that, PDAM also takes part in business operation from determining raw water availability, raw water transmission, water treatment facilities, clean water transmission, reservoir unit development to water distribution to customer. Generally speaking, local government has ownership and rights in water resources, where some of the authority in the determination of the raw water amount needed for production is given to

PDAM.

2.2.2 Water Rights and Access to Clean Water

According to Burchi and d'Andrea (2003)(10), water right can be defined as *the right to take and use water subject to the terms and condition of the grant.* In WWF (2007) it is stated that *water right is also considered as a formal or informal entitlement which confers on the holder the right to withdraw water.* From this term, there are two categories of water rights which is basic water rights and water use right. In Indonesian case, the former is guaranteed in the constitution whereas the latter which is involving administrative process of water allocation, such as licensing, regulated by laws. Water use right lead us to water allocation, a process where an available water resource is distributed (or redistributed) to legitimate claimants, and the resulting authorian for use is granted, tranferred, reviewed and adapted (ADB, 2008 p.1)(1).

Indonesia's Water Resources Law (Law No.7/2004) defines water for basic need as a basic water right by establishing the state's responsibility to guarantee water for redumentary needs (ADB, 2008). In the article 5, it is stated that *the State guarantees the right for every person in obtaining water for minimum redumentary daily use to fulfill a healthy, clean and productive life.*

This Water Resource Law has been a milestone of the change of paradigm in Indonesian water management. As stated by Sarwan et.al., (2005):

> *Water resources are a national resource that must be managed wisely and sustainably to secure the greatest benefit for the welfare of existing and future generations.However, water scarcity has the potential to create conflict among beneficiaries and between communities of users. Therefore, sustainable water management is considered a strategic task, essential in sustaining national development and requiring a national commitment. In the past, water resource development strategies tended to emphasize the supply side. Water was treated as a free good, and stakeholder participation was quite limited. In many basins, the current strategy for the development and management of water resources is now focusing on the demand side. To achieve efficient water allocation, it is understood that it is now necessary to establish a water use rights system*

The quotes above expressed that as the paradigm has shifted from viewing water as free good to be more efficient use of water as ne challenges emerges such as increasing population and sustainable development issues, water allocation is considered the most important element in water resource management. In this sense, the role of government in every level becomes more important in promoting effective management policies of water, partucularly in developing a system for water allocation and water right administration(Sarwan et.al., 2005)(72) According

to Law 7/2004, water uses are distinguished either for basic needs and noncommercial purposes uses including domestic/household uses and traditional agriculture which are excluded from formal permit requirements. Due to the climate characteristic of Indonesia, during the shortage, especially in the dry season, water use is prioritized for domestic use and agriculture in existing small-scale irrigation systems. Exploitation uses are for mainly commercial uses that obviously need formal licensing.

As further, Sarwan et.al., (2005)also emphasized several principles in order to implement water use rights in three principles: general use, efficiency and sustainable supply. These principles are explained as follows:

1. General use refers to an understanding that a clear, complete, and detailed water right arrangement will secure the right of parties to use the water as appropriate to their basic needs, received on time in sufficient quantity.

2. Efficiency refers to an understanding that a clear, complete, and detailed water right arrangement will create an obligation of the water user to use the water (1) for beneficial purposes; (2) as efficiently as possible; (3) without endangering the environment, the water resources quantity and quality; and (4) without unnecessarily impairing or disturbing other users ability to use water.

3. A sustainable supply refers to an understanding that a clear, complete, and detailed water right arrangement will reflect conditions specific to each basin and locality in the resulting water allocation system, including both long-term and real-time aspects of water allocation, as well as the national social and economic perspective on water resources.

Table 2.2 shows that the usage rights can be acquired without permit to fulfill daily basic needs for individuals and peoples agriculture located in irrigation systems. Daily basic needs here consist of the need for health, clean and productive life purposes which include water used in religious services, drinking, cooking, bathing, and washing. However, for the purpose of to supply irrigated agriculture, it requires a permit if such condition applied such as: 1)if it involves changing the condition of the water resource; 2) if it takes large volumes of water; 3) if it occurs outside of existing irrigation systems. Further, it is stated that the permits are required if water use exceeds 2 liters per second per household head, and that pumping requires a permit even if for people agriculture (Sarwan et. al., 2005)

In this term, water uses for PDAMs can be categorized as commercial uses (see Table 2.2). Following decentralization era, Central Government have transferred part of authorities in

Table 2.2: Water Rights and Licensing

Type of Rights	Method to obtain	Target	Purpose
Communal s	without License $< 2l/s$	Individual	Basic Daily needs
		Individual or groups	Community, Agriculture in existing irrigation
	with License	Individual	Basic Daily needs
		Individual or groups	Agriculture outside existing irrigation
		group	Basic Daily needs
Commercial	with License	Individual/group/organization	need for business or commercial use

Source: Law No.7/2004, Dir. Water Resources and Irrigation, Bappenas

asset management to lower level of government namely Provincial Government as well as Regency or City Government. The Act Number 22/1999 (followed by revision in Law No. 32/2004) regulates about transfering governing authority (including natural resources management) from central government to local governments. In addition to that, Water resources law also has changed the previous water rights in a community level in which it states that *customary rights must have been confirmed by regional government regulation*, in this terms the local government are much more dominant in determining appropriate permit as well as policy.

Together with the transfer of natural resources management, the Law also regulates about funding mechanism, infrastructure and human resources. However, ADB 2008 has summarized, several issues on water supply system provision facing the government post stipulation of Law No.7/2004 as follows:

1. Groundwater licensing is operated by district (municipalities).
   In this condition, PDAM water provision by using surface water requires permit from provincial government. However, it is still ambiguous because practically in some regions permit system operated by some provinces under previous law while others is given under provincial regulation.

2. Water trading is not permitted in the law. However water commercialization is possible by establishing State Owned Company as operator. For example some State Owned Company have authority in river water and can provide water to PDAMs.

3. Decentralization process has led to the lack of coordination between stakeholders, for example between spatial planning and water resources planning process.
   Formation new autonomus regions raised issues on interjurisdictional coordination in water

supply system. This is very complicated due to different point of views of local leaders and many political interest involved.

4. Insufficient cost recovery from commercial users.
   In the case of PDAMs, not every customers can afford the price of water, as consequence, PDAMs applied block price where non-commercial users are subsidized. However, many PDAMs facing problem on cost recovery nowadays due increasing production cost and difficulty in increasing price. Some local governments provide subsidies but budget allocations insufficient to cover the cost. Previously, central government can intervene, however after decentralization, local governments should overcome this kind of issue.

Regarding the third issue, generally even in international jurisdictions, there are no formal regulation systems on ownership of the water. However international water agreements usually applied by adopting generalized principles for sharing transboundary water (Wang et.al, 2007)(91). In order to handle issues of water management between inter-jurisdictions or inter-municipalities, Provincial Governments could play important role. For example, even though local governments by the law are given the authority for levying tax for groundwater use, that kind of tax should be part of provincial government revenue. For example, it is apparent that the tax for surface water as well as ground water were stipulated in the law, where the use of groundwater should pay tax at 20%.

The following parts describe how residents in urban area can access clean water by using several resources.

1. Private Individual Wells. Most households in Bandung Regency and Cimahi City rely on individual wells in supplying water or household needs. It can be categorized as deep wells, nevertheless they more or less are shallow of around 20 meter deep on average. To lift water from the well, households mainly use a traditional well pump or electric pump (jet pump, etc.). Due to the location differences, in the dry season households usually face their wells run dry and they need to deepen their well, otherwise they move to another alternative of water resources. Anticipating dry seasons, local governments usually prepare water supply transported by designated cars, operating artesian wells and public hydrants.

2. Pipeline Connection-PDAM. Another alternative of water supply access is connection to PDAM. PDAM, local enterprise which is owned by the city/regency local government, provides clean water to it customers. The quality of water provided by PDAM is better

than groundwater, however the coverage of service is still low. Neverthless the supply is sometime uncertain depending on the household area, and also the quality of water is still not potable, that means households/customer should boil it first before consuming for drinking or use in cooking.

3. Water Vending. Water Vending is probably one of the oldest ways of providing clean water to human society, however it is still exist in these regions particularly in dry seasons. Water vending is also considered as one of symptoms of a failure in piped systems which is expected could cover the whole area of regions. It also can be seen as world phenomenon of water provision which is providing water only to a minority of urban dwellers. This phenomenon was discussed in detail in survey conducted by Kjellen et al (2006)(36). It is an informal form of selling water into households by business person so called water vendor. This business opportunity is taken as a very simple business chain. A vendor simply take tap water or well water from his house and fill it into containers called jerry cans (usually can contain waters around 30 litres) then sell it door to door by employing deliverers with a cart. A cart itself can contains 5 jerry cans.

4. Ready-to-drink Water or Gallon water or packaged water. Due to the poorness of water quality supplied by PDAM, private well as well as water trade, some households also tend to buy drink water from market in pet gallon containers provided by big companies. The quality of water is better than the others which means people can drink and use it for cooking safely, however the price is quite high. Households usually use this kind of water only for personal daily life purpose like drinking or cooking.

5. Others water resources. Many households could not have access to those kind of water supply mentioned above due to the poverty. These people simply rely on water surface water as well as rain water for their daily life such as drinking, cooking as well as laundry.

The following Table 2.3 shows a comparison between water price of PDAM and other resources namely cart Water as well as ready-to-use water (gallon water) in the market.

Indonesian Ministry of Public Works is the key institution who are responsible in water management including PDAMs. The role, neverthless has been shifting nowadays due to increasing role of local governments authority as part decentralization process. From 1999, the role of central government has been limited to be focussed on regulating as well as coordinating

Table 2.3: Water Price Comparison Between Several Sources

Clean Water Sources	Price (Rp./l)
PDAM	3
Cart Water	50
Ready to Drink Water *Gallon*	500
Public Hydrant	Rp 25,000/month

Source: USAID, 2006

intersectors associated with water sector. As stated by General Directorate of water management (2008), quantity of water has been huge issue especially in urban areas, and this issue strongly correspondence with management of local government. Ari(2011) has summarized several important points in relationship of water resources management and drinking/clean water provision in Indonesia generally such as degradation of water resources, lack of beneficiaries role and community participation and poor investment both by government and private.

Nationally, Central Government has initiated such actions to improve water resource management. However drinking water issues related to institutional relationship particularly between local governments or interjurisdictional water resources issues emerges. Several actions has been undertaken to control potential water conflict and improve the quality of coordination and cooperation between stakeholders of sectors associated with water sector, however, sometimes dispute between local governments concerning asset sharing and asset management still occurs nowadays.

2.3 Access to clean water in Bandung Regency and Cimahi City

This section descibes general descriptions of Bandung Regency and Cimahi City in order to give brief explanations about characteristics of both municipalities. We discuss regions characteristics to understand the problem related to water resources and water supply system provision in those regions. This section also describes a study case of interlocal government water supply system provision. Aim of this section is two folds. First, we investigate the issues in the study area, which are important as the background of our study. Second, we elaborate those issues to becoming problem statements which is needed for developing our model. In order to confirm such issues we conducted a series of interview with keypersons involved in the policy making process to undertake the problem.

2.3.1 Brief Descriptions of Bandung Regency

Geographically Bandung Regency lies between $6°41'$ until $7°19'$ South transversal and $107°22'$ until $108°5'$ East Longways. Based on administrative, Bandung Regency has region which border as follows:

1. Northern with Purwakarta Regency and Subang Regency
2. Eastern with Sumedang Regency and Garut Regency
3. Southern with Cianjur Regency and Garut Regency
4. Western with Cianjur Regency
5. Middle part with Bandung Municipality.

Great Bandung Regency including Bandung Regency and Cimahi City in 2006, has population 4,399,788 people and Bandung Regency constitutes one of the biggest regency in West Java, which is as big as 327,434 Ha with density about 1,391 people/km^2. Historically, Cimahi City and Bandung Regency were one regency so called Bandung Regency. Together with Bandung City, the capital of West Bandung Province, and Sumedang regency, people usually include them as parts of Bandung Greater Area or BMA. BMA itself consists of Bandung Metropolitan City and urban areas surrounding it.

In order to give brief information of the location of our study area, we depict following Figure 2.2 which shows location of Bandung Regency and Cimahi City in the context of Indonesia.

2.3.2 Access to Clean Water in Bandung Regency

Access to PDAM Tirta Raharja

Groundwater use is prioritized for domestic use and others meet certain conditions that also require license from City Mayor or Regent. In the case of Bandung Regency and Cimahi City, particularly in urban area, service level of existing piped water supply by PDAM is somehow intermittent and unreliable. Such conditions imply additional cost to piped water users which lead to extremely excessive use of ground water. This typical condition usually can lead to the depletion of groundwater table and in some area land subsidence. PDAM Tirta Raharja serves Bandung Regency and Cimahi City with 49,270 units connections covering 342,132 people of both regions with average 6.9 people/connection. The needs of water was predicted incerase

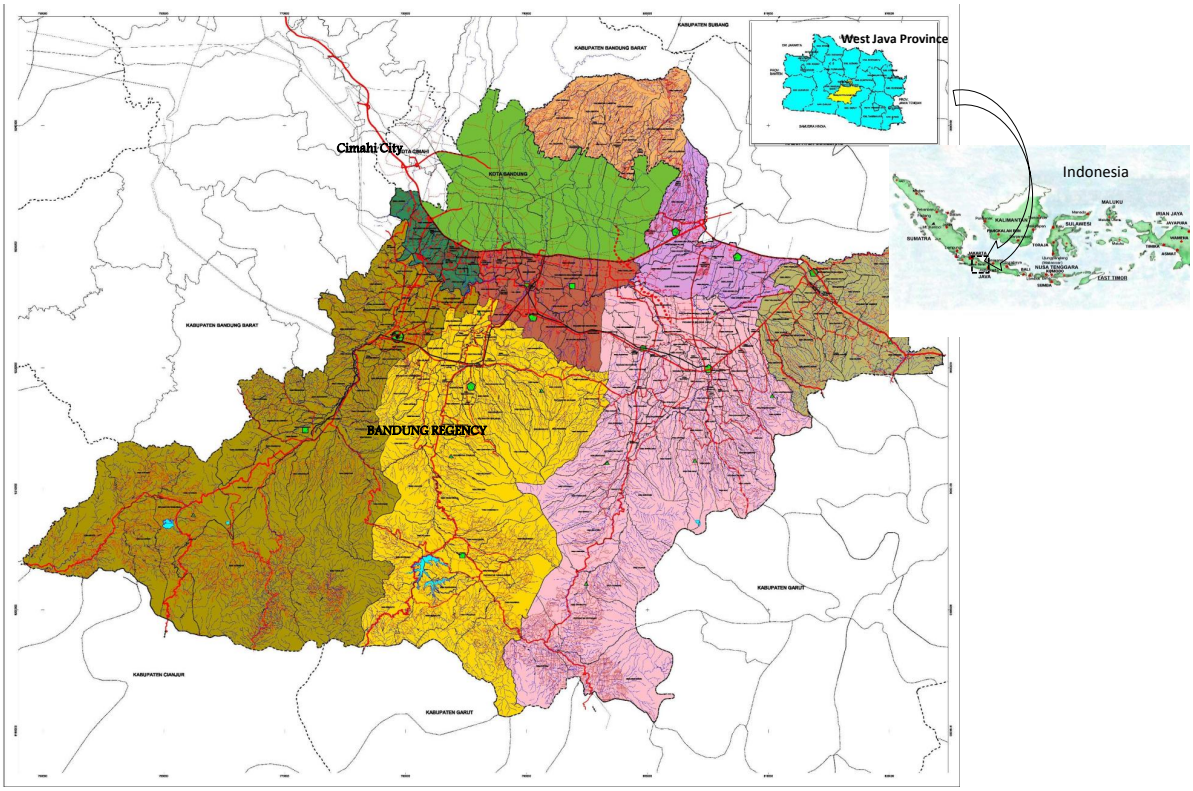


Figure 2.2: Map of Bandung Regency and Cimahi City

Source:Regional Spatial Plan of Cimahi City, 2003

following the growth of Bandung Regency population. In 2006, poduction capacity of PDAM Tirta Raharja is 537 l/s. However, PDAM' service is targetted to achieve 20% by 2015 and 30% by 2030, or in average equivalent with 90 litres/person/day. To fulfilled the target, PDAM capacity is required to be 2,500 l/s in 2015 and achieve 4,600 l/s in 2025. Those target obviously demanded new water source for according the target year 2,000 l/s and 4,300 l/s respectively.

Tabel 2.4describes how PDAM Tirta Raharja supply water to Bandung Regency and Cimahi City. There are 2 cities in Bandung Regency that mostly supplied by the water company namely Soreang City and Banjaran. However until 2005, only 26.3% of households in Soreang City could access to PDAM connections whereas in Banjaran City even much smaller 2.3%. Tabel 2.4 describes such condition.

Table 2.4: PDAM Connections in Soreang City and Banjaran City 2006

Cities	Districts	Villages	No. Connections
Soreang	Soreang	Soreang	719
Soreang		Keramatmulya	102
Soreang		Panyirapan	40
Soreang	Ketapang	Cingsin	2,222
Soreang		Total	3,426
Banjaran	Banjaran	Banjaran Wetan	249
Banjaran	Banjaran	Banjaran Kulon	271
Banjaran	Banjaran	Kamasan	311
Banjaran	Banjaran	Ciapus	497
Banjaran	Banjaran	Tarajusari	34
Banjaran	Pameungpeuk	Bojongmanggu	98
Banjaran	Arjasari	Batukarut	292
Total			1,752

Source:PDAM Tirta Raharja, 2006

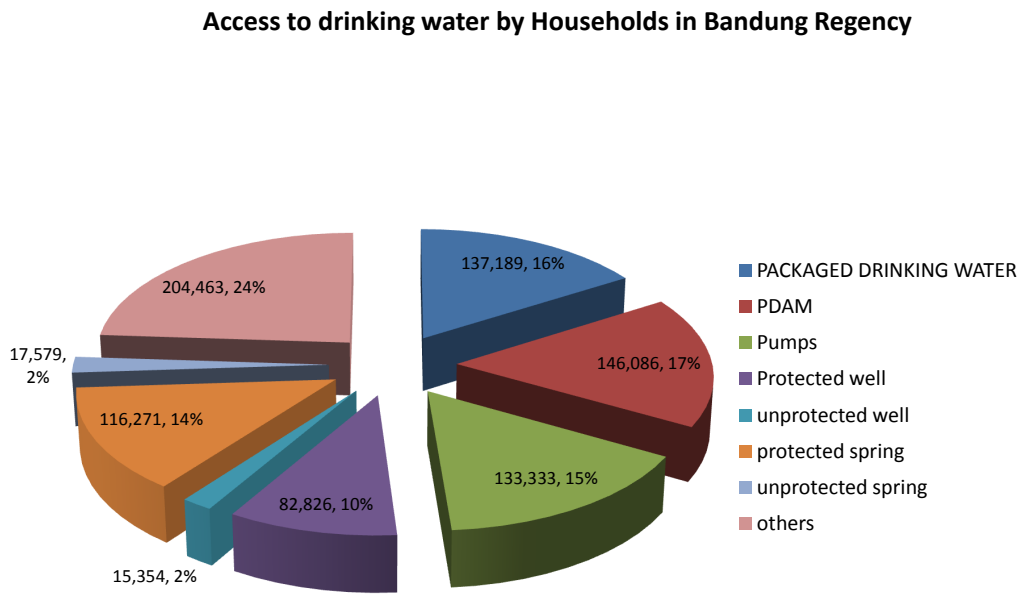
Access to Others Water Sources

Due to the lack of access to PDAM particularly either because of limited connections and PDAM water price and also poor quality of private wells, some regions in Bandung regency should looking for alternative water sources. In order to provide adequate water supply, some communities proposed cooperative actions with local governments to realize a community based water supply system. Generally, local governments provide budget for developing physical infrastrustures of water supply system while operational and management were left to communities. Until 2005, 219 villages of 440 in Bandung Regency has established community based water supply system.

Water sources issues are also very important in developing this community based WSS and it vary according to regional characteristic in Bandung regency. Usually those community who attempt to establish the community based WSS should find adequate water source needed. Some communities rely on spring water, artesian well ao even PDAM water if available whereas construction of reservoir, transmission and distribution system could be provided by local government by using particular asset such as available land, or private land which is rented by profit sharing system. Table 2.5 shows established Community Based WSS in Bandung Regency.

In order to support capacity building in management of this community based water supply system, local government also provides technical training as well as workshop for

Figure 2.3: Access of Households to Drinking Water Source in Bandung Regency



Source:Bandung Regency Social Economic Survey, 2011

Table 2.5: Community Based WSS in Bandung Regency 2007

Cities	Districts	Villages	Water Sources
Soreang	Soreang	Karamat Mulya	Spring
		Soreang	Deep well
	Katapang	Sekarwangi	Deep well
Banjaran	Banjaran	Ciapus	Spring
		Kamasan	Deep well
		Sindangpanon	Deep well
	Pameungpeuk	Langonsari	PDAM
		Rancamulya	Deep well
		Bojongmanggu	PDAM

Source:PDAM Tirta Raharja, 2006

community members regularly.

2.3.3 Brief Descriptions of Cimahi City

Located near by Bandung Metropolitan City, Cimahi City has been considered as a satellite of Bandung since decades ago. The city has grown rapidly especially after 2001, when Cimahi City legally administered as an autonomous city thus requires more investment in infrastructure particularly in water supply. This subsection describes general view of Cimahi city, including population growth, distribution and of course water supply issues.

Based on Population Survey in 2000, population of Cimahi City is 442,977 and grows 2.63% per year. With population density 107.07 person/ha, average family number is 3.63/household. Distribution of city population and its projection are shown in Table 2.6 below.

Table 2.6: Number of Population of Cimahi City, 2006-2010

Districts	2006	2007	2008	2009	2010	Rate (%)
Cimahi Selatan	224,028	239,440	254,851	264,286	267,759	3.15 (%)
Cimahi Tengahs	166,239	170,439	174,638	180,308	182,188	2.41(%)
Cimahi Utara	132,464	141,389	150,313	154,501	157,576	3.77(%)
Total	522,731	551,267	579,802	599,095	607,514	3.08(%)

Source:Profile of Cimahi City, 2010

In Medium Term Development Plan of Cimahi City, residents who has access to clean water is 80% in target and it is much higher compare to Provincial target which is 67-72% in 2013. Another comparison can be seen in Table 2.7 that shows comparison of Human Development Index between National, Provincial and Cimahi City.

Table 2.7: HDI of Cimahi City, 2010

Index	National	West Java Province	Cimahi City
HDI	71.76	71.64	75.17
Education	92.20	81.14	89.58
Adult Literacy Index		95.93	99.64
Purchasing Power		62.10	62.41

Source:Statistic Centre Beureu, 2010

According to Cimahi City Populationn data (2010), 37.37% of population are employees in private sector, 14.99% entrepreneurs, 9.42% public servants including (military, police and retired persons). Another groups are labors 11.64%, merchants 4.2 % and unemployed 16.32%. In 2010, GRDP of Cimahi City was IDR 12,845.60 billion which was increased by 9.94 % from

previous year. Table 2.8 shows the budget of Cimahi City in from 2007-2010.

Table 2.8: Actual Revenues of Cimahi City, 2007-2010 (in million rupiahs)

No	Revenue	2007	2008	2009	2010
1	Regional Income	62,154	74,162	78,719	105,475
	Regional Tax	15,163	15,706	16,712	36,553
	Regional Retribution	37,069	45,216	10,284	7,459
	Regional Asset revenue	4,034	5,447	5,647	9,162
	Others	5,886	9,907	9,162	52,229
2	Balancing Budget	367,562	415,274	242,532	399,440
	Shared revenue Budget	41,876	44,520	55,182	42,500
	General Allocation Budget	305,008	339,006	342,055	354,972
	Special Allocation Budget	27,677	31,747	27,297	1,968

Source:Cimahi City regional Budget , 2010

We note that Balancing budget is shared revenue between West Java Province and Cimahi city as stated in Law of Fiscal Balancing of Regional and Central Government. In addition to that, the contribution of Regional Income of Cimahi to Regional Budget has been slightly increasing from 11.02% in 2007 to 15.21% in 2010. We particularly note this regional income figure as local government usually attempts to increase i addition to balance budget sharing. Regional income has been important indicator of regional growth due to decentralization era.

Acces to PDAM Tirta Raharja Branch I-Cimahi

Cimahi City residents obtain PDAM pipelined water from the service of PDAM Tirta Raharja, owned by Bandung Regency local government. In order to provide clean PDAM water to Cimahi City, PDAM Tirte Raharja use water sources from Cikudapati spring, Cisintok spring, Deep well 11 and 13 and Water Treatment Installation Cipageran. PDAM Tirta Raharja supplies clean water to 13 of 15 districts in Cimahi City, with 11,309 connections for approximately 56.545 persons or about 11.4% of total populations. According to consumer category, household is 94% of the total registered customers followed by business sectors 3.48%, military base 1.10% and the remains including public hidrant, social inctitutions, governments, industries and others. In details, the composition of customers is shown in Tabel 2.9

Table 2.9 shows the mostly way of households in Cimahi City to access clean water instead of PDAM water. In order to get clean and affordable water, usually households in a

Table 2.9: Water Services Coverage in Cimahi City

Districts	No. of Households	No. Households Accessed to PDAM	Households using Artesian Well	Households using Private well
CIMAHI SELATAN		2,804	1,650	22,271
Melong	10,343		550	5,862
Cibeureum	13,811		250	6,038
Utama	6,124	506	300	4,104
Leuwigajah	9,842	1,537	250	3,988
Cibeber	6,126	761	300	2,279
CIMAHI TENGAH		8,314	450	15,791
Baros	6,315	1,378	150	2,324
Cigugur Tengah	8,914	756	300	4,752
Karang Mekar	3,250	7,494		1,752
Setiamanah	4,403	1,641		2,300
Padasuka	9,992	1,930		3,445
Cimahi	2,530	1,115		1,246
CIMAHI UTARA		2,786	750	12,813
Pasirkaliki	3,202	505	300	1,639
Cibabat	9,234	799	150	4,504
Citeureup	6,472	767		3,037
Cipageran	7,990	715		3,633

Source:Cimahi City White Book of Sanitation, 2011

nearby neighborhood share water from particular private well. They share pipelines as well as electricity cost thet needed to pump out the water. From the pictures we can see how households connected to same private well. However, so far there is no such regulations for determining the limitation of water use from private well.

In 2004, Cimahi City local government predicted the future demand of clean water in Cimahi City. From 2.10, we can see that Cimahi City has an obligation to fill the gap of water demand from 57,042,600 liters/day in 2004 top 84,199,680 liters/day in 2012.

Condition above has led us to the challenge facing Cimahi City Local Governments. From the technical point of view, development of PDAM capacity can be supported by existing water source around Cimahi City. For example, by optimizing water intake from several water sources as well as establishing additional reservoir around Cimahi River. However, policy constraint issues emerges due to the authority of current PDAM Tirta Raharja which is under Bandung regency Local Government.

Households using private wells (1)

Households using private wells (2)

Households using private wells (3)

Pipeline connections are used to share water taken from private well.

Figure 2.4: Access to clean water by Households in Cimahi

Table 2.10: Demand Prediction for PDAM Water of Cimahi City 2012

Districts	Demand 2004	Demand 2012
Cimahi Utara	18,454,950	30,892,860
Cimahi Tengah	23,912,850	28,589,760
Cimahi Selatan	32,041,200	42,083,460

Source:Regional Spatial Plan of Cimahi City, 2003

Water resource which is used by PDAM Bandung Regency comprises: Surface water, Ground Water, and Springs. Raw water resource taken from Cijenggel River/ Situ Lembang is the main source of pure water storing system in Cimahi City which has tapping capacity ± 168 litre/second. The long distance of raw water transmission from Cijanggel/Lembang Lake to Cimahi City imply water quality is below the standard for human consumption. So that raw water from Cijanggel River should be first processed before distributed to customers. A complete processing installation is built in Cipageran. From intake Cijanggel River to water

treatment plant 5 Tanks for Releasing Depression.

The other main source of raw water is 2 (two) active drilling wells, Drilling Well 11 and Drilling Well 12 with total production of ± 7 litres/second. While other alternative of raw water is coming from Spring waters located in Cikudapati Spring and Cisantole Spring which each is able to produce ± 3 litres/second and 7 litres/second. From the two springs, raw water flows through distribution network to the customers by using gravitation system.

Tabel 2.11 below shows current condition of PDAM Tirta Raharja Branch Cimahi.

Table 2.11: Production, Distribution and Water loss of PDAM Tirta Raharja Branch Cimahi January-June 2010

Parameter	Realized (m^3)
Water Production	10,127,398,76
Distributed water	9,212,602,09
Water sold	5,607,446,00
water loss (non revenue water) (m^3)	3,605,156,09
% Loss water from distribution	10,127,398,76

Source:Master Plan of Sanitation, Cimahi City, 2010

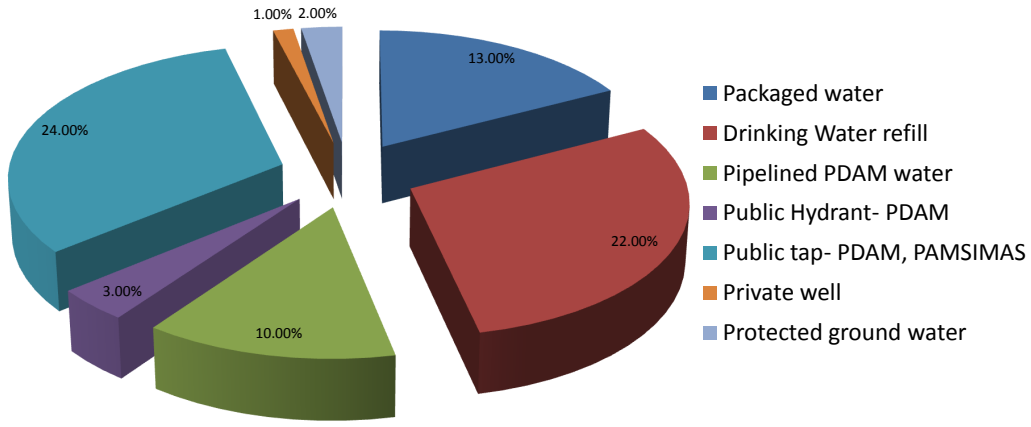
Acces to Alternative Water Sources in Cimahi City

A study conducted by EHRA in 2011 (Cimahi City, 2011) shows how residents access clean water in Cimahi City as shown in Figure 2.5 below. It is shown that, citizens of Cimahi City is 10% only covered by PDAM water.

A study by Tukimin (2004)(81) conducted in Cimahi Selatan showed that the quality of PDAM water consumed by households is good. The indicator of water quality itself is based on physical which are not colour, no smelled and no taste. In terms of quantity, due to limited capacity of water provided by PDAM, they use several alternatives among them are private wells, shared connections, public hydrant, water vendor and neighbor connections. It is very common that households have more than one water sources, due to limited capacity of PDAM and continuity of service, for example, PDAM could not cover 24 hours service. Particularly in dry season, PDAM service decreases in terms of continuity, where periodic services applied in 2 days duration, 12 hours duration, and 6 hours duration. Those conditions forced customers to find other alternative water sources.

In his study, Tukimin (2004) stated that 60% of consumers of PDAM in Cimahi Selatan

Figure 2.5: Access of Households to Drinking Water Source in Cimahi City



Source:Cimahi City' Sanitation Whitebook, 2011

also have access to alternative water sources, whereas among 30% of PDAM non-consumers, some households have more than 2 alternative water sources.

2.4 Current Condition of PDAM Development in Indonesia

In terms of clean water supplied by PDAM, Kodoatie (2003) depicts water supply system in Indonesia which can be simplified into:i. water resources; ii. treatment; iii. Storage; iv. Trasmission; vi. distribution to consumer. The graph in Figure 2.6 explained the relationship between those components.

According to Easter and Hearne (1995), in order to obtain economies of scale that result from large, lumpy investments, the delivery of water services tend to has a natural monopoly characteristic. This characteristic may lead to the condition where the firm or company that supply water can prevent potential competitors from entering the market by charging low prices and then, after the competition is eliminated, charge much higher prices. In the case of water

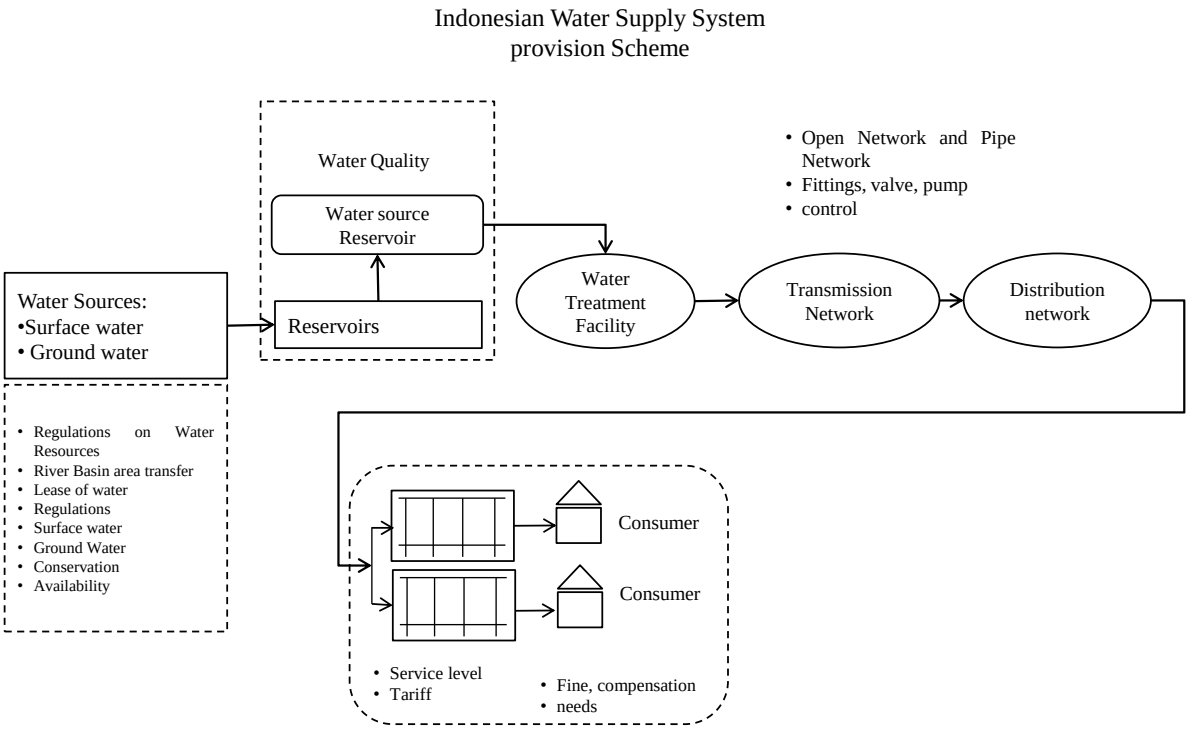


Figure 2.6: Water Supply System scheme in Indonesia

supply provision, the authority in determining production level and price is based on regulation of regent or mayor of the city. However due to characteristic of geographical area, some regions still rely on other regions in supplying raw water as input for clean water pr oduction. Hence, water use right regulation between cross-jurisdiction is still debatable, and until now solution for conflict between jurisdiction are met solely by bilateral{or more} agreement. However, in the case of conflict between Cities or Regencies, Provincial Government can play role as mediator.

Political process is needed to meet the target of local government who play the role in providing water for its residents. Local government usually establishes local enterprise such as PDAM to deliver such obligation. PDAM itself is a semi-private company, which is partly owned by local government but with more private oriented objectives. PDAM mainly has a monopoly previlege in providing piped water and distribute it with household connections. However production level and water price determination is still the domain of local government

which is depending on the political process involving. The relationship of local government with PDAM managerial can be seen in the following diagram in 2.7

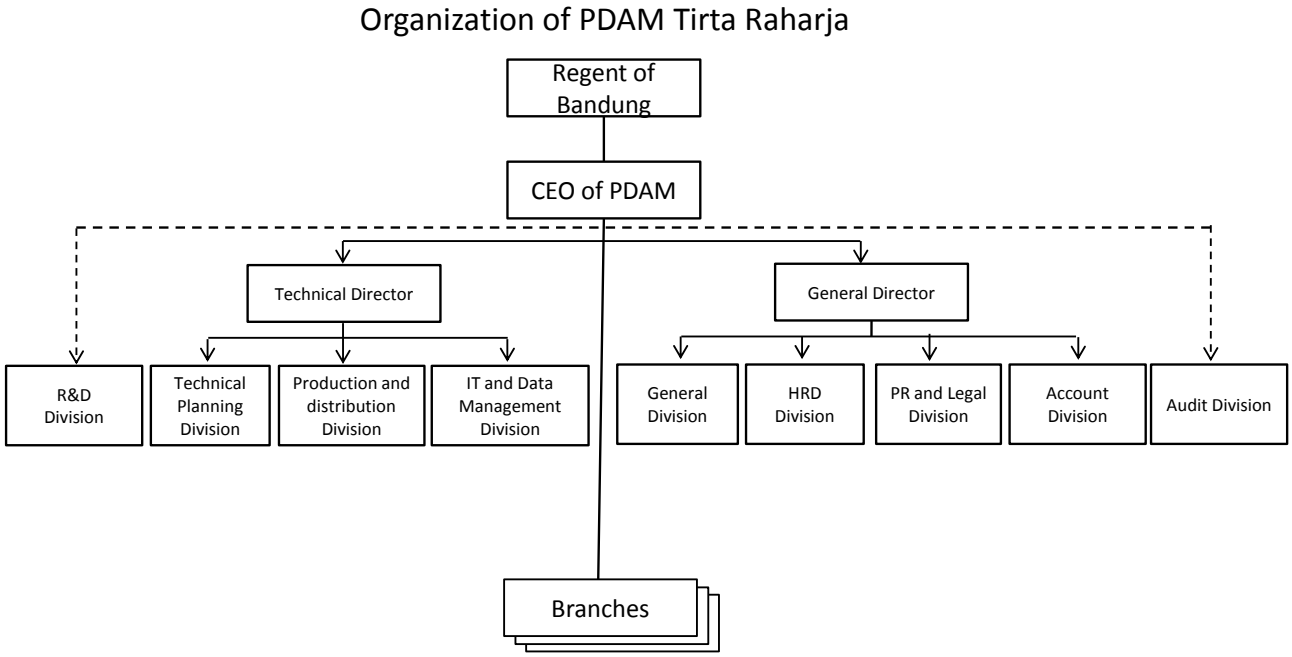


Figure 2.7: Organization of PDAM

Source:PDAM Tirta Raharja, 2006

Historically since the early of New Order era, or Orde Baru which was very centralized, Indonesia has experienced institutional changes in water sector. In 1968, only a few cities owned public water supply enterprises (PDAMs), but following the decentralized era, currently the number has increased to around 300 enterprises. Due to lack of budget in infrastructure investment and the need to improve good governance, a local government can arrange a cooperation with a third party, especially for water provision that is usually monopoly (Decree of Minister of Internal Affairs 43/2000). According to Government Regulation No. 14/1987, water supply system particularly in urban areas, are provided by PDAMs, in semi-autonomous joint management where local government owned shares partially. By November 2010 (Perpamsi,

2012), there were 402 entities of water supply system providers in Indonesia. Three categories of the entities consist of: i) local enterprises (PDAMs); ii) water supply boards/units under local governments; and iii)private providers. PDAMs are distributed to 83 cities and 319 regencies in which they can be categorized according to number of customers they have as follows: 12 PDAMs has costomer larger than 100,000, 19 PDAM with 50,000 - 100,000 costumer, 20 PDAMs with 30,001 - 50,000 costumer, 136 with 10,001-30,000 costomer and 212 have less than 10,000 costumer. However based on the performance evaluation by BPP SPAM-Supporting Board of Water Supply System Provision (2009) there are 103 PDAMs with 'healthy' performance, 115 PDAMs were markes as 'not healthy' and 119 PDAMs were notified as 'ill'. Ministry of Public Works in 2010 also stated that there are 8,032,099 customers who accessed to PDAM water representing 24% of national coverage service which is distributed in urban areas (47%) and rural areas 11%.

Local government has authority on making policies on level of service PDAM water as well as price. In addition to that, PDAM plays a role on business operation from determining raw water availability, raw water transmission, water treatment facilities, clean water transmission, reservoir unit development to water distribution to customer. Briefly, local government has ownership and right in water resources, where some of the authority in the determination of the raw water amount needed for production is given to PDAM. However, there are many regulations, mostly involving different sectors and government layers that should be taken into account.

In general, water supply system administrations applied in all cities and regencies of Indonesia are similar and can be divided according to government level. In central level, PDAMs should deal with Ministries which are responsible in health issues (Ministry of Health, Ministry of Environment), water resources and drinking water issues (Ministry of Public Works), and planning and investment issues (National Development Planning Board and BPPSPAM). In provincial level, PDAMs need to coordinate with provincial offices related to water resources, mining and forestry due to regional sustainability issues. At last, in local level PDAM operationally are required to coordinate with local planning devision, environment division, city/regency revenue division and health division. In addition to that, such issues on service capacity and price determination also required approval from house of representatives.

However, due to very poor management, many PDAMs have been rated 'unhealthy' by Ministry of Public Works MPWbased on their services as well as financial performance. In 2002, MPW evaluated that only 27 PDAMs were rated as healthy or only 9 % of the total, while

31% were classified as less healthy and the remaining 60% were rated 'unhealthy'.

Thanks to the reform efforts by Central Government this condition has turned to promising performance in 2009 while 42% has been rated "healthy". However from estimated 120 million population that live in urban area, currently only 30% urban dwellers have access to PDAM service due to limited budget of PDAMs for new investment as well as maintenance the existing infrastructure. This conditions are resulted from their high level of debt, difficulty to get new investment and inefficiency isues. Another dilemmatic issue is considered as political constraint of local governments, where in one hand PDAMs are required to expand its coverage capacity but on the other are refused to increase tariff.

In decentralized era, the role of PDAMs as local enterprises is to provide service for the residents in the city/regency. PDAMs are pushed to earn sufficient revenue to cover cost and expenses incurred, such as payment for operational and maintenance expenses, interest cost and principal past due capital goods expenditure (including rehabilitation cost) and give contribution to Regional Income (PAD). Usually operational revenue originates from water revenues that consist of water tariff revenue and fixed charges, and non water revenues that consist of new connection fees, penalty and others. However, the largest portions of total operational revenues come from water tariff and fixed charges.

Like many developing countries, Indonesia also is facing water supply and demand problems. Regarding the management of PDAM in local level, there are some problems that stil emerge such as the amount of unaccounted-for water which is high in urban areas, water looses as result of poor system design and management of PDAM and difficulty as implication of low water charges which result inefficiency of water uses. World Bank, (1992) described *one review of World Bank-financed water supply projects showed that the effective price charged for water was only about 35 percent of the average cost of supply, while for irrigation, the water charges cover an even smaller share of average cost and are generally not based on the volume taken.*

According to Easter and Hearne (1995)there are several issues that are very critical in water management practices. Mishandling those issues might have caused misallocation, pollution, and waste of water resources:

1. Fragmented water resources management has led to overinvestment and uncoordinated management,especially for water from different sources, e.g.,surface water and ground water.

2. Excessive reliance on overextended governmental agencies lacking the proper incentive structure has resulted in poor service quality

3. Failure to decentralize the delivery of water services and the lack of stakeholder, community, and private-sector involvement, has yielded a vicious cycle of unreliable service, low willingness to pay, and a further decline in capacity to provide the services.

4. Inadequate coordination of international and interstate water resource use and development has caused overexploitation and pollution of important surface and groundwater resources.

5. Underpricing of water and the lack of cost recovery has resulted in excessive water use, pollution, resource misallocation, and nonsustainable water service entities.

2.5 Profile of PDAM Tirta Raharja

2.5.1 Profile of PDAM Tirta Raharja

PDAM Tirta Raharja has been established since 1926, previously named Water Leiding Bedriff (in Dutch). Back to colonization era, it was initially proposed to provide clean water for Dutch community in Cimahi and Lembang. Then in 1977 based on Regional Policy No. XVIII followed by Governor of West Java Decree No. 510/H.K/011/SK/77 the water company was turned to be PDAM Kabupaten Bandung (Bandung Regency) with objectives both to providing clean water for Bandung Regency residents and contributing to regional income. PDAM Tirta Raharja had coverage service for Bandung Regency and Cimahi City with support from 6 branches which provide one region or more according to distance. Figure 2.8 shows one of the branch of PDAM Tirta Raharja in Cimahi which is Water Treatment Facility.

The following subsection investigates how citizens in Bandung Regency and Cimahi City have accesses to clean water based on the regions characteristic. Both local governments, however, still in dispute in how to manage the asset of PDAM Tirta Raharja because since 2001 Cimahi City had been separated from Bandung Regency which imply to the need for separation in asset management including the water company.

2.5.2 Coverage Area and Capacity of PDAM Tirta Raharja

At present PDAM Tirta Rajarja in Bandung Regency, which is covering services for Bandung Regency, Cimahi City as well as West Bandung Regency, operates with production

Water Treatment Facility of PDAM Tirta Raharja, Cimahi (1)

Water Treatment Facility of PDAM Tirta Raharja, Cimahi (2)

Water Treatment Facility of PDAM Tirta Raharja, Cimahi (3)

Water delivery truck

Figure 2.8: Water Treatment Facility of PDAM Tirta Raharja in Cimahi

Source:Data Collection

capacity 724 liter per second(lps). PDAM, a Local Water Supply System Enterprise, is owned by local government as the share-holder. Local government points Supervisors Board as well as Directors Board to run the enterprise. Administratively, PDAM Tirta Raharja provides services for 3 regions: Bandung Regency (population: 3,1 million), Cimahi City (population: 567.000, and West Bandung Regency (population:1,5 million). The PDAM Tirta Raharja' number of customers recently (December 2008) only reached 51.331 SR (equals to 409.000 population), distributed as shown in Table 2.12.

There are mainly 27% of the customers are located in Cimahi City area with 96% domestic connections. Hence generally PDAM only cover 8.2% of total population in the three regions (Bandung regency, Cimahi City and West Bandung regency). In Bandung regency, there are 2 main region with large costomer of PDAM water which are Soreang and Banjaran. The water production, distribution and loss for the regions is shown in Table 2.13.

Table 2.14 shows water sources used for production of PDAM Tirta Raharja. From total available water sources around 749 l/s, used capacity for PDAM water production only

Table 2.12: Number of Connections and People Serviced by PDAM Tirta Raharja

Branch	Amount of Connections (SR)	Number people serviced
Soreang	10,887	76,552
Ciparay	11,306	80,834
Rancaekek	5,126	31,660
Lembang	4,599	32,910
Padalarang	3,208	24,930
Cimahi	14,144	95,246
TOTAL	49,270	342,132

Source:PDAM Tirta Raharja, 2006, note that SR stands for Sambungan Rumah or household connection

Table 2.13: Water Production, Distribution and Loss in Bandung Regency, 2004

Cities	Production (m3)	Distribution	Sold	Loss	Loss Percentage (%)
Soreang	1,681,343	1,552,883	986,767	584,116	37,61
Banjaran	793,213	743,993	365,859	378,134	50,82
Bandung Regency	17,942,176	16,827,989	9,966,788	6,861,201	40,77

Source:PDAM Tirta Raharja, 2006

551.25 l/s. Water sources used varies from river, spring and drilling well. Using spring water for production is preferable due to its low production cost. Mostly water source taken from spring do not required expensive water treatment process to reached safe water standard. However, taking water source from river, particularly with contaminated river water issue imply more expensive production process.

Table 2.15 below describes technical data of PDAM Tirta Raharja, including capacity and water loss that has been suffered which is usually called Non-Revenue Water (NRW). We highlight the technology used for water distribution mainly rely on gravity and electric pumps. This technology highly is depending on the geographical condition of region. Electricity used for pumping water also dealt with electricity price, that could lead to increasing tariff issue.

From the administrative data in Table 2.16 it is apparent that counsumers of PDAM covering households, social and government facilities, business and public purposed facilities. Household is the largest number of customer of PDAM Tirta Raharjam followed by business sector and public hydrant/public toilet, in which PDAM Tirta Raharja portrays obligation of clean water provision for people in rural area or for those who have very scarce water sources.

Table 2.14: Water Source Available and Water Used for PDAM Tirta Raharja

Area (Water source)	Availabla Capacity (l/s)	Used Capacity
Soreang (River)	60	55
Banjaran (River)	40	26.58
Ciwidey (Spring)	20	0.78
Pangalengan (Spring)	30	25.58
Ciparay (River)	200	167.32
Pacet (Spring)	5	2.29
Paseh (Spring)	5	0.3
Cicalengka (Drilling Well)	8	3.42
Rancaekek (Drilling Well)	24	19
Cisarua (River)	36	22.65
Lembang (Spring)	38	24.33
Batujajar (Spring)	30	20
Cikalong Wetan (Spring)	8	6
Cililin (River)	20	10
Padalarang (Drilling Well)	28	20.5
Cimahi (River)	197	147.5
TOTAL	749	551.25

Source:PDAM Tirta Raharja, 2006

Table 2.15: Technical data of PDAM Tirta Raharja

Technical Aspects	Amount
Length of Transmission pipelin	20 km
Length of Distribution pipeline	14,300 m
Delivery system	Gravity and electric pumps
No. Installation units	6
Installed capacity	724 l/s
Used capacity	532.68 l/s
Distributed water per year	18,820,189,63 m^3/year
Sold Water per year	11,503,318 m^3/year
Water loss	38.88%

Source:PDAM Tirta Raharja, 2006

Table 2.17 below shows the description of financial condition of PDAM Tirta Raharja. In annum, they can obtain revenue around IDR 40 billion and some of it goes as contribution to the gerional income.

Table 2.16: Administrative data of PDAM Tirta Raharja

Service data	Unit
Population	5,058,438
Coverage population	2,729,647
No. of Customer	56,486
Households	53,822
Social Facilities	73
Business	1,452
Industries	52
Government Facilities	274
Public Hydrant/public toilets	552
Others	259

Source:PDAM Tirta Raharja, 2006

Table 2.17: Financial data of PDAM Tirta Raharja

Basic Tariff	IDR 2,100
Production cost	n.a
Operational cost	IDR 40,316,052,913
Operational cost	IDR 50,116,052,913
Total revenue	IDR 46,707,382,392

Source:PDAM Tirta Raharja, 2006

2.5.3 Water Price Determination

Usually a water company can review the price periodically, for instance every three or five year, to adjust its profit, however considering the ownership of PDAM, it is very difficult to increase tarif every year by the rate of inflation. Due to such a condition, sustainibility of PDAM should be supported by local government financial system. In addition to that, PDAM also suffers so called non revenue water issues which is 35% in average (MPW, 2004). An interesting example of difficulty facing the PDAM for incerasing the water price could be seen in the text below which is explaining condition of PDAM Jakarta by Wibowo and Mohamed (2007)(92):

> *Typical concession agreements entered into between the government and watersupply operators in Jakarta establish that tariff is set automatically every 6 months. The tariff structure consists of two elements: (1) water charges to be paid by the government with NRW rates being one of the parameters, and (2) water tariff to be paid by the users. In 2007, operators submitted a proposal demanding a 30% tariff*

Table 2.18: Branches of PDAM Tirta Raharja Bandung Regency and Capacity

Branches	Service Location	No. House Connections
I	KP Ciwidey	52
I	KP Pangalengan	2759
I	KP Soreang	6,258
II	KP Baleendah	1,378
II	KP Ciparay	4,085
II	KP Majalaya	4,808
II	KP. Pacet	274
II	KP. Paseh	82
II	KP. Bojongsoang	679
III	KP. Cicalengka	422
III	Rancaekek	4,704
IV	KP. Cisarua	2,524
IV	KP. Lembang	2,075
V	KP. Batujajar	660
V	KP. Cikalong Wetan	277
V	KP. Cililin	571
V	KP. Padalarang	1,700
VI	KP. Cimahi	14,144
GRAND TOTAL		49,270

Source: PDAM Tirta Raharja, 2007

> *increase but the government denied their request arguing that they failed to bring NRW rates (which were hovering around 50% at the time) down to the target level of 37%. However, to honour the concession agreement which stipulates semi-annual tariff increases, the government eventually allowed the tariff to rise by no more than 10%. Although insufficient to cover future investments, the operators had little choice but to accept the 10% tariff increase. Clearly, if not properly resolved in the near future, the tariff problem will be a hindrance to attracting prospective investors. This signifies how imperative it is to develop a clear, fair and unambiguous tariff structure within a socially and politically tariff-sensitive environment.*

In 2009 PDAM Tirta Raharja increased the tariff gradually until Rp 2,100/m3 and it is applied for customers in the whole service area including customers in Bandung Regency itself, Cimahi City and West Bandung Regency as well. This decision was based on Regent of Bandung Regulation No. 52 2008, however as the consequence of tariff increase the agreement on profit sharing with the others 2 regions still in negotiation process.

The structure of clean water tariff in PDAM Bandung Regency consist of 4(four) water consumption blocks and 4 (four) customer groups(33). In order to attain the objectives effectively, tariff adjustment must be based on several basic principles, such as:

1. Cost Recovery: That the fixed drinking water tariff should generate income that the minimum value thereof can cover the entire operational expenses, or full cost recovery, where average tariff is equivalent with principal cost, assuming that PDAM will be able to defend and improve quantity, quality, further service continuity, and generate sufficient operational profit for investment and contribution to the Original Regional Revenue as dividend return on equity of the Regional Administration.

2. Affordability: That all groups of community, particularly household customers, must be able to afford the tariffs in order to fulfill their basic needs. Therefore, the tariffs are divided into different classes according to their affordability level, and imposed by cross subsidy from strong to weak economy classes.

3. Water Use Efficiency:That in order to manage or encourage equal water use by customers, drinking water tariffs are prepared progressively for customers whose water use level exceeds minimum standard of basic need.

4. Simplicity:That the adjustment of water tariff is simplified based on classification and water use block.

5. Transparency: That in the determination of the water tariff, PDAM must prepare and deliver information to customers clearly and openly, concerning tariff calculation and determination, and hold consultancy and introduction to customers before the determined tariff is applied.

The structure of clean water tariff should follow Regulation of Ministry of Home Affairs concerning Guidelines on Drinking Water Tariff Determination at PDAM. Legal framework of tariff determination is following Central Government as well as Local Government regulations, such as:

1. Government Regulation No. 16 of 2005 regarding Development of Drinking Water Provision System;

2. Regulation of the Minister of Home Affairs No. 2 of 1998 regarding Guidelines on Drinking Water Tariff Determination at PDAM (Regional Water Company);

Table 2.19: Water Price Comparison Between Several PDAMs in Indonesian Cities

PDAMs	Low	Ave
Bandung Reg	1,000	3500
Bandung City	560	2014
Jakarta *TPJ*	4,367	6000
Makasar City	1000	4500
Semarang City	1608	4500
Sidoarjo Regency	1,350	3700
Tangerang Regency	1850	4500

Source: USAID, 2006

3. Instruction of the Minister of Home Affairs No. 8 of 1998 regarding Implementation Directives on Drinking Water Tariff Determination at PDAM (Regional Water Company).

The following Table 2.19 indicates a comparison of the lowest tariff, average tariff, and year of the last tariff increase between several PDAMs in Indonesia, including PDAM Bandung Regency. It is apparent that PDAM Bandung has the second lowest tariff and lowest average tariff among the PDAMs on the list.

Figure 2.9 shows the profit/loss of PDAM Bandung Regency during 1996-2003. Before 2002, PDAM Tirte Raharja suffered loss, however after 2002 they started to gain profit. Some portion of the profit goes to becoming contribution for regional income of Bandung Regency.

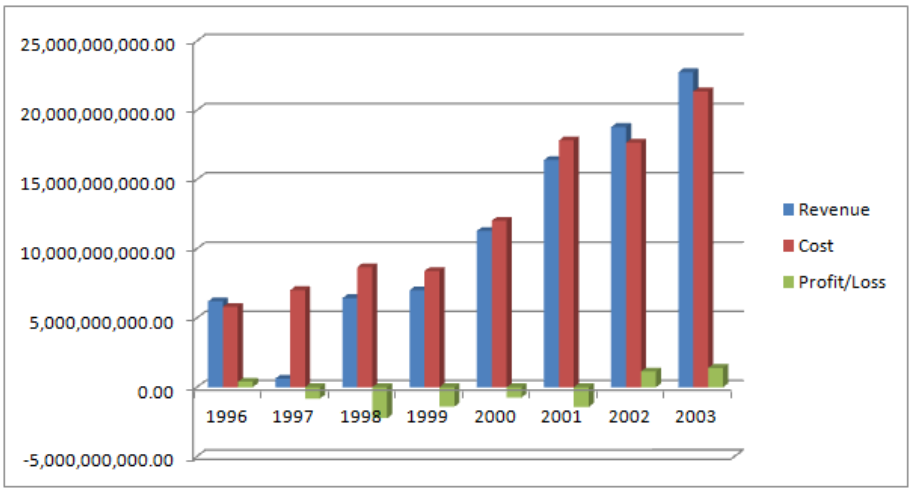


Figure 2.9: Profit/Loss of PDAM Bandung Regency 1996-2003

2.6 Asymetric Ownership in Water Supply Provision-Case Study PDAM Tirta Raharja

2.6.1 Problem statement

In this section we continue discussion to summarizing conditions of PDAM Tirta Raharja. As a matter of fact, we found that dispute on ownership of PDAM Tirta Raharja until the writing of this dissertation still emerges. First we describe some problem statements to be confirmed later. Second, we report a result of interviews with keypersons who are responsible in decision making associated with the problems. The interviews has been conducted in the middle of March 2012 while the author visiting Indonesia. We arranged several meeting discussion with keypersons in research of PDAM and its relationship with decentralization policy, the PDAM Tirta Raharja's keyperson itself and a representative of Cimahi City government who is in charge of city infrastructure planning including water supply system provision. The main objectives of interview is clarification of the problem statements that have been formulated and based on interview results, we can develop a model describing such conditions in terms of economics point of view. Further, we show its implications theoretically for social welfare and economic efficiency in both municipalities and finally resolving solution in the view of economics

2.6.2 Results of Interviews with Key Persons involved in PDAM Tirta Raharja

In order to support as well as to enrich our assumption, we conducted interview for key persons involved in decision making of PDAM. Among them are the keyperson in PDAM Tirta Raharja and Keyperson in Local Planning board of Cimahi in Infrastructur division. This section addresses the result of our data collection as well as interviews with those persons.

Interview with Keyperson of Cimahi City Local Governmnet

In this paper we attempt to formulate problem statements associated to the ownership issues. According to that, we firstly we investigate some issues to be confirmed later. Second, we report a result of interviews with keypersons who are responsible in decision making associated with the problems. Finally we concludes. So in the process, we identified some issues as follows:

1. There were historical contingencies of decentralization in Cimahi City and Bandung Regency, which imply difficulties in negotiating asset share issues

2. The real problem of WSS in Bandung Regency associated with water source problem of Bandung regency water supply system;

3. Issues on assymetric ownership of PDAM Tirta Raharja, which is controlled by Bandung Regency when Cimahi City does not have not authority;

4. Identifying the structure of the problem for developing of theoretical model of proving the policy.

In order to clarify those issues we conducted several interviews with key persons in Bandung region. The interviews were conducted in the middle of March 2012 while the authors visiting Indonesia. We arranged several discussion with keypersons associated with water provision research, particularly PDAM and its relationship with decentralization policy. We visit the PDAM Tirta Raharja's keyperson and a representative of Cimahi City government who is in charge of city infrastructure planning including water supply system provision.

The main objectives of interview is clarification of the problem statements we formulated and based on interview results, we can develop a model describing such conditions in terms of economics point of view. Further, we show its implications for social welfare and economic efficiency in both municipalities and finally resolving solution in the view of economics.

We also emphasized the objective of our interview which is to gain information whether our assumption is correct or not.

Interview with keypersons of Cimahi City and PDAM Tirta Raharja

The result of interview with Cimahi City officers is summarized below:

1. Bandung Regency and Cimahi City are different in terms of water sources availability. Bandung Regency has many alternatives to get water other than PDAM compare to Cimahi City. If PDAM Bandung Regency want to make more money they tend to expand the capacity by investing to improve capacity in Cimahi City because Cimahi City has more potential consumer.

2. People in dry seasons suffers the shortage of water supply, hence Cimahi City requires adequate and stable water supply system when people suffers shortage of private well, community based, spring etc. They want to invest in WSS to avoid dry season. But eventhough Cimahi city government want to expand the capacity, they could not go further due to the lack of authorithy in PDAM ownership issue.

3. There could be some research aiming to answer what is the cost of this current asymmetric control of PDAM, as well as attempt to provide some alternative ways as policy implications to solve the problem.

Several current condition in the progress of the attempt to cooperate with Bandung Regency can be concluded as stated below:

1. Regarding policy making process of PDAM, Cimahi city should deal with political constraints in terms of difficulty to establish a mutual agreement due to conflict of interest during political process.

2. Political, financial issues, depending on investment from central or provincial government, in other words they are involving efforts to coordinate with several institutions both in provincial and central level

3. Independent PDAM has been promoted by technical assistant from National Development Planning Board in the PPP book however it is not feasible in terms of debit capacity and shortage in water resources.

4. Provincial government is also involved in the plan of independent of PDAM Cimahi City which is also supported in the provincial framework together with the concept of Clean Water Provision System. One of the action is cooperation with community based water provision which are already exist.

5. Currently PDAM Cimahi City service level decreased to 11 % from 18% due to rapid population growth. It is apparent that the remainder rely on other water sources such as deep well, and community based water supply system provision, though they should potentially deal water shortage during dry season.

6. Establishment of Kelompok Pengelola Air (water group management, a community based action initiated by local community with partial support from local government) is one of attempt to solve water supply problem by involving community participation.

Interview with Keyperson of PDAM Tirta Raharja

In an interview with PDAM Tirta Raharja officer, we confirmed several issues on ownership of PDAM asset between Bandung regency and Cimahi City as follows:

1. Ownership issues of PDAM Tirta Raharja has been emerged between Bandung Regency and Cimahi City local governments.

2. In terms of responding Cimahi City aspiration regarding possibility to be involved in management as well as asset transfer due to consequences of Decentralization, it could be a difficult process and takes a long time of negotiation

3. PDAM Asset should be considered as a sepe-rated asset of local government due to involvement of private sector in the provision. However, regulation on such issues has not been clear yet.

4. Around December 2011, there was a MoU facilitated by ADB discussing possibility of win win solution based on profit sharing mechanism between Bandung Regency, Cimahi City and West Bandung Regency. However the process of MoU is still doubtful due to political interest.

5. Financial structure of PDAM Tirta Raharja is independent to local government accounting system. However, as a local enterprise in which part of company shares is owned by local government, profit shareing and revenue is regulated. Some portions of profit goes to regional income whereas other portion can be used to new investment.

6. Possibility to cooperate with other local gov-ernments is difficult, however cooperation between local enterprises could be one promising option. As a matter of fact cooperation between PDAM Tirta Raharja with local enterprise of Bandung Barat regency has been established these years in some part of water supply system provision.

Below pictures show the process of interview we conducted in the middle of March 2012 in Cimahi City and Bandung, West Java Indonesia.

2.7 Overview of Cooperation between Municipalities

2.7.1 Current Conditions

Decentralization policy in Indonesia is one of promising objectives of Reformasi 1998. However, implementation of this policy required strong commitment in every level of government. Shah and Thompson (2004)(68) underlined that the main purpose of decentralization is to enable local governments in providing public services and even more responsive to their residents. In contrast, Firman et.al (2008)(31) highlited the negative consequences of the policy that lead

Interview with Dr. Ibnu Hadi, ITB, one of Indonesian Prominent researcher on Water Supply System Development in Indonesia

Interview with Mr. Heri Antasari, Head of Infrastructure Planning Division of Cimahi City Development Planning Board

With staffs of Mr. Heri Antasari, Head of Infrastructure Planning Division of Cimahi City Development Planning Board

Interview with Ms. Hendriati, Technical Manager of PDAM Tirta Raharja

Figure 2.10: Several Interviews conducted with keypersons related to issues on PDAM Tirta Raharja

local governments to be more reluctant in establishing cooperation, for instance, in providing shared public facilities.

According to Sharpe(1995)(73) in Slack (2007)(75), in attempt to reduce cost of public good provision, voluntary cooperation between municipalities or local governments could be one possibility as minimal government restructuring. They argue that voluntary cooperation could be a promising solution for decentralized era where intergovernmental transfers has been limited due to governance change from centralized to decentralized. They also highlight some benefit of cooperation between local government such as no permanent agglomeration and independent institutional status which are common in USA and France. In particular condition cooperation between local government is politically easy to establish and can be disbanded relatively easy. Table below shows several forms of cooperation between municipalities in many countries.

Institutional arrangement as the result of cooperation between local government could lead to fund policy, for example it can levy taxes or collect contributions from the municipalities

Table 2.20: Table Form of Cooperation in many countries

Countries	Cooperation Form	Notes
Bologna, Italy	48 municipalities and Provinve of Bologna	Mayors and President
France	Consortia, comminities of communnes, urban communities	
Spain and Belgium	Joint, Intermunicipal, authorities	
Netherland	Public bodies, Joint Agencies, core cities	
Vancouver, Canada	Well-established structure	political linkage

Source: Slack, 2007

or can levy user fees to pay for services. This is interesting because cooperation could be a means for local government to increase their capacity in public good provision, to help them to achieve economies of scale as well as to deal with externalities issue. However Slack (2007) emphasized that acountability issues between local government should be considered as cooperation involving public good provision established. To avoid such problems, it is very important to ensure that local governments who involve in cooperation have same objectives.

Another important issues in establishing cooperation between local government is bargaining among local government involved. Due to asymmetric condition, it could be possible if some municipalities have not much to bargain with other local governments. In the case of pulic good provision, for instance, it could be due to limited in availability of natural resources or budget constraints. In order to avoid the potential conflict in the future, appropriate contracts or agreement should be applied in inter local government cooperation.

2.7.2 Difficulties

According to Laquain, (2005) (42) and Firman (2008)(31), nowadays it is very difficult for central government to motivate cooperation between local governments in Indonesia. They discussed case studies in several Indonesian metropolitan cities consisting neighboring municipalities which are expected to cooperate for more efficient infrastructure development. However, there was an experience about Kartamantul Joint Secretariat, located in Greater Yogyakarta, Indonesia, as one of moderate success story in attempting cooperation between local governments. They empirically investigated how those local governments established a Mutual Decree of Regents of Bantul and Sleman as well as Mayor of Yogyakarta, in forming a joint secretariat that functions as coordinating board of planning, implemention, monitoring and evaluation of urban infrastructure within the Greater Yogyakarta. (Firman, 2008)(31).

Regulation on possibility to cooperate:

1. Local Government Cooperation is agreement between governor with other Governor or Governor with Head of Regency or Head of City (Mayor) or Head of Regency or Head of City (Mayor) with other Head of Regency or Head of City (Mayor) and or Governor, Head of Regency or Head of City (Mayor) with third party which is made in written and have rights and obligation.

2. Third Party is Department/Government Institution Non Department or other call, Legal Private Corporation, State Corporation, Local Corporation, Cooperative, Foundation, and Legal internal institution.

3. Cooperation Organization is a forum to do the cooperation which has pointed representative member from Local Area to held cooperation.

4. Local Area cooperation object is all of government affair which have became authorization of autonomy area and as public service provider.

5. Instructional Management Local Government Cooperation is done by:(i)Head of Local Government or one of party as a pioneer or offer cooperation planning to the other head of local government and third party about such an object.(ii)If the parties as pointed above on point (i)accepted, cooperation planning can be increased by making cooperation agreement and prepare cooperation agreement

6. Head of Local Government can publish Empowerment Letter to accomplish cooperation planning.

7. The result of local government cooperation can be money, bonds, and assets, or the non material advantages which become the local rights in the form of money must be save to the local cash as Genuine Local Government revenue in accordance with the legal regulation.

2.8 Challenges

Developing theoretical model in order to describe such conditions however needs a case study as an example to approach the model close to the reality. We will explore a case of water supply system provision in Bandung Regency and Cimahi city, which are 2 neighboring municipalities in West Java Province Indonesia. Some characteristics of this regions are explained

as follows. Bandung Regency and Cimahi city are different in terms of water source availability. Bandung Regency has many alternatives in terms of how its residents can obtain clean water other than PDAM (Local Enterprise on water supply system provision) compare to Cimahi City. If PDAM want to make more money they will expand by invest to Cimahi City because Cimahi City has more potential consumer.

People in dry seasons suffers the shortage of water supply but Cimahi City still has adequate and stable water supply system. However Cimahi city cannot control the PDAM water supply, even though people suffers low quality of water from private well, community based, spring etc. They want to invest in WSS to avoid dry season, but eventhough Cimahi city government want to expand the capacity, they could not go further due to the lack of authorithy in PDAM ownership issue. This research is trying to answer what is the cost of this current asymmetric control of PDAM, as well as attempt to provide some alternative ways as policy implications to solve the problem.

Decentralization policy in Indonesia is one of promising objectives of Reformasi 1998. However, implementation of this policy required strong commitment in every level of government. Shah and Thompson (2004) underlined that the main purpose of decentralization is to enable local governments in providing public services and even more responsive to their residents. In contrast, Firman et.al (2008) highlited the negative consequences of the policy that lead local governments to be more reluctant in establishing cooperation, for instance, in providing shared public facilities.

According to Rosenthal (2003), existence of markets for piped water (and sanitation) services can be distinguished from conventional markets due to its difficulty to be served by more than one firm in same location or region. In terms of huge initial investment needed for establishing water distribution network and decreasing cost for additional consumer, it is very common globally to provide this public good by only one particular firm. In most of developing countries, this monopoly characteristic is one of the main roles of local government. Neverthless, in a setting of PDAM Tirta Raharja that involving 2 neighbors local governments, Bandung Regency and Cimahi City, we have been shown asymmetric ownership of PDAM. Further we discuss whether cooperation between local governments in provision of such good is efficient or not by understanding Indonesia decentralization.

According to Sharpe(1995) in Slack (2007), in attempt to reduce cost of public good provision, voluntary cooperation between municipalities or local governments could be one possibility as minimal government restructuring. They argue that voluntary cooperation could be

a promising solution for decentralized era where intergovernmental transfers has been limited due to governance change from centralized to decentralized. They also highlight some benefit of cooperation between local government such as no permanent agglomeration and independent institutional status which are common in USA and France. In particular condition cooperation between local government is politically easy to establish and can be disbanded relatively easy. Table below shows several forms of cooperation between municipalities in many countries.

Institutional arrangement as the result of cooperation between local government could lead to fund policy, for example it can levy taxes or collect cont ributions from the municipalities or can levy user fees to pay for services. This is interesting because cooperation could be a means for local government to increase their capacity in public good provision, to help them to achieve economies of scale as well as to deal with externalities issue. However Slack (2007) emphasized that acountability issues between local gov-ernment should be considered as cooperation involving public good provision established. To avoid such problems, it is very important to ensure that local governments who involve in cooperation have same objectives.

Another important issues in establishing cooperation between local government is bargaining among local government involved. Due to asymmetric condition, it could be possible if some municipalities have not much to bargain with other local governments. In the case of pulic good provision, for instance, it could be due to limited in availability of natural resources or budget constraints. In order to avoid the potential conflict in the future, appropriate contracts or agreement should be applied in inter local government cooperation. Decentralized local governments are challenged to resolve problems of economies of scale and interjurisdictional provision of public services.

In a fragmented system of local governments, efficiency in public good supply also need to be considered. In the case of asymmetric ownership between Bandung regency and Cimahi City local governments, we proposed that interlocal cooperation could be an alternative for resolving inefficiency of water supply system provision in Bandung region. According to ACIR(1985) in Shresta,(2008)(71) interlocal cooperation can be defined as voluntary exchange between autonomous local governments for efficient supply of public services without surrendering their autonomy. Further, Axelroad(1984)(5) emphasized that interlocal agreement as a result of cooperation is an attempt of individual jurisdictions to pursue their self-interest without the aid of a central authority to force them to cooperate each other.

In decentralization era, interlocal cooperation can be considered as an intermediate approach in resolving diseconomies of scale in the production of services by broadening the con-

sumption base by means lowering the average cost of production (Satterfield, 1947)(63). Local governments can cooperate each other both by using formal or informal agreements(Zimmerman, 2007) (Post, 2004)(**?**) (60). By taking US as example, about 61% cities receives service in 1972 as result of interlocal governments. It was apparent that interlocal government also played significant role in performance of budget and expenditure. Survey of ICMA in US reported that interlocal cooperation has been in three important ways in local service provision, just under in-house, and private.

2.9 Conclusion and Topics Future research

There are 2 main objectives of this chapter that can be concluded as follows. The first objective is to describe condition of water governance and water supply system provision in Indonesia which can be concluded as follows:

1. Decentralization policy has implied the governance of water supply system provision in Indoensia. Enacting of Law on water resources, in which decentralization policy is incorporated, the role of government in every level has been divided. Central governmemt authority has been partly transferred to local governments which implies to push local governments play more important role in water supply system provision, both in urban and rural area.

2. Current condition of water supply system provision in local level has been investigated, we found that local governments are suffering the lack of budgeting in their attempt to increase the service, in order to achieve national target, for instance, MDGs target. Local governments nowadays, are facing the challenge to be more independent in terms of searching source of fundings for investment in water supply system provision project. In this sense, cooperation with other local government becoming one option of alternative way.

3. Investigation on a case in Bandung region, involving Bandung Regency and Cimahi City result in a formulation of problem statement due to emerging ownership issues PDAM Tirta Raharja. By conducting data investigation as well as interview wth keypersons in the regions, we formulate problem statements regarding the case.

4. Asymmetric ownership issues that occurs in the case of PDAM Tirta Raharja is considered as the implication of decentralization process in Indonesia.

5. We propose a concepts of interlocal government cooperation as a means to resolve asymmetric ownership between Bandung Regency and Cimahi City

Regarding the decentralization and water governance finding of the research, we found that after decentralization, water supply system provision in Indonesia has turned to be more complex. Local governments now are facing challenges that vary from nature and technological issues to socio-economic issues. It is apparent that decentralization of water management, cannot solve all water problems, however such decentralization efforts have improved the efficiency of water allocation in a number of countries. To understand how decentralization affects the efficiency of water allocation requires justification in a broader scope, for instance in national level. That could be a topic for future research.

Another topic is how to establish an institutionnal arrangement for resolving water scarcity to the local governments where developing PDAM is not sufficient for particular region. Some attempts have been conducted by local government, for instance by Bandung Regency to provide water in rural area, in the forms of communal water provision. Incorporating cooperation between local government and community group, could be a topic for future research.

The second objective is investigation of a case of water supply system provision in Bandung region that lead to asymmetric ownership issues between Bandung regency adn Cimahi City. The finding of our investigations is that Local governments nowadays are facing challenges on coordination and cooperation issues. However, decentralization policy also leads to emerging difficulties in establishing cooperation respective local governments. In the case of PDAM Tirta Raharja ownership, the difficulty emerges is due to political constraints and conflict of interests among parties involved. We highlight that asymetric ownership issues could be one critical factor that result in inefficiency of water supply system provision in Bandung region. To resolve such a difficulty issues, a research investigating the process of agreement between local governments is needed. The future topic research might be involving attempts to incoorporate fairness issues on the agreement between local governments which is not incorporated in this research.

Chapter 3

Literature Review

3.1 Basic Idea

This chapter discusses literature review on concepts related to public good provision, decentralization and cooperation between local governments and its implications. Previous chapter has shown us condition of water supply system provision in Indonesia, in which we also have been introduced a case of asymmetric ownership of water supply system provision in Bandung region. In this chapter we attempt to conduct literature review to understand such conditions from economics point of views. Hence, relevant materials related to concepts of public goods provision in local level are discussed in order to develop deeper understanding in emerging issues on local public good provision and cooperation between local government. We mainly in general review basic concepts of public goods from literature on public economics and discuss how they are provided by local governments. We explore research works conducted by researchers and scholars in the field of theoretical public economics to obtain fundamental issues as well as to find whether there is room left to be filled in. Later on we discuss the role of local governments in public good provision by discussing their behaviors in decentralized decision making process. Last section shows current development of research in cooperation of local government topics in which we discuss factors that were considered as barriers to establish cooperation. Finally, we introduced implication of cost allocation rule on water supply system provision in Indonesia, particularly when cooperation between municipalities occurs.

3.2 Public Goods and Public goods Provision

Public goods or sometimes called collective goods is a class of good which has such properties that are distinctive compare to other goods. Survey by Oackland (1987)(52) and Cornes and Sandler (1996)(24) explained the fundamental concept of public goods in a general way. However, this part was not intended to list discussions emerged in this growing field. Public goods can be categorized as goods that are not used up in the process of being consumed or utilized as an input in a production process (Oackland, 1987). Deeper description by Samuelson in his seminal papers (1954,1955)(64) (65) stated that public goods main property is where one man's consumption doesn't reduce some other man's consumption. Definision above distincts public goods from private goods, where the latter consumption or utilization extremely means no longer be used to others. In the case of pure public goods, other important properties of the goods that should be considered are non-excludability and non-rivalry of the goods. Taking an example where we want to optimize resource allocation in a world with public goods. In his seminal paper, Samuelson introduced a condition when there are 2 goods, one purely public goods and the others purely provate. Efficiency can be defined by satisfying,

$$\sum_{i=1}^{n} MRS_{zy}^{i} = MRT_{zy} \tag{3.1}$$

where z and y are public goods and private goods respectively.

The equation 3.1 is the well known Samuelson Condition which can be interpreted as condition where the efficiency of pure public goods production must be satisfied as long as pareto optimality is achieved.

We understand that such kind of goods, due to increasing population and shortage of resources could lead to congestion. In this case, consumption by one agent could diminishes the others and this condition might exceed the capacity. In order to increase the aggregate utility as well as capacity, user charge policy usually applied to cover the production cost. In the case where policy-makers choose optimal user charges, they need to know congestion cost occurs and characteristic of users which is the main target of user charges policy. Hence policy-maker can distinguish whether there were groups who enjoy the benefit of such public goods exist or not due to congestion issue. This condition will lead us to next discussion of club goods and local public goods.

3.3 Club goods and Local Public Goods

3.3.1 Club goods

Where there are more than one congested public goods, the needs to form group population according to their consumption pattern is emerged. This action allows the member of groups or later on clubs is who solely can enjoy the benefits of its own public good where he/she belongs to. In reality, it can be one facility so as to enjoy one should become member first in which fees usually applied. Scotchmer (2002)(66) argues that competitive market will function efficiently to provide club goods so that public provision shall not be needed. This argument is strongly related to ideas stating the reason of agents to form groups is to avoid externality on each other. Discussion about club goods originally stated by Buchanan(1965)(11) where he highlighted that the main source of externalities are public services. It is extended by Berglas (1976)(12), Berglas and Pines (1981)(13). Comprehensive surveys for this topics are conducted among others by Sandler and Tschirchat(1980)(69) and Todd and Sandler (1990)(76).

Disussion on club models is heavily involving attempts to analize the existance of equilibrium. Some important equilibrium concepts have been proposed by researchers started by Buchanan model (11) where he assumes 'anonymous' crowding which means every member of the club is alike, so that only the number of club member matters but not necessarily the characteristics of the member. The Buchanan Model, however, has been extended as well as modified in many ways by incorporating equilibrium concepts such as the core, competitive equilibrium, Nash Equilibrium and free mobility equilibrium. The latter is which is based on the well known Tiebout model, has been a foundation for the topics where club theory is associated with jurisdiction issue. Equilibrium in this Tiebout model is reached when agents can 'vote with their feet' to find the jurisdictions that best satisfy their tastes and should be an efficient one (Scotchmer, 2002).

3.3.2 Local Public goods

Another classification of goods close to club goods is local public goods which is our main concern in this research. Local public goods have characteristics where it is not necessarily congested, but has a spatial or geographical constraint. generally speaking, local public goods provide benefits only to those resident of particular geography region (Oackland, 1987).

Interest of many scholars in local public goods discussion might be started and stimulated by the seminal work of Tiebout (1956)(77) in where he suggested that if there were enough

communities,individuals would reveal their true preference for public goods by their choice of community in which to live (Atkinson and Stiglitz, 1980)(4). He continued to state that those who have decided to live with others in the same community would have the same tastes and such a local public goods equilibrium would be pareto efficient. This terms is well known as efficiency based on 'vote with their feet' which we discussed in the previous subsection. This free-mobility equilibrium has attracted many researchers few decades ago because such condition is quite familiar with systems in Western Democracies where there usually exist majority voting which plays significant role in determing local services.

This suggestion also has been critized by many researchers in public economics field. Among them was Stiglitz (1977)(4) who highlighted non-convexity property which is essential characteristic for such good provision to individual. Tiebout model, however, is still influenting in discussion of local public goods due to its similarity to the concept of market equilibrium and has stimulated other researchers to extend the model according to another possible settings.

Current research in local public goods field can be categorized to discussion on optimum provision of local public goods and other important issues such as:

1. how the level of public good supply is determined within community
2. what is the most considered as given of decision makers in deciding on the level of local government expenditures
3. consideration about miggration issues which was very important in Tiebout model
4. are there any discriminatory policy to immigrant who move to one region than to original residents?

For more detail discussion, see Atkinson and Stiglitz (1980)(4).

There are some remarkable works by researchers interested in the topic of optimum provision of local public goods. William (1966)(93) discussed how local government determine the optimal provision of public good with setting of 2 local governments who attempt to provide public goods with spillover. In a simple game theoretic framework Cremer et.al (1997)(19) discussed how 2 community setting that attempted to decide whether or not to invest in the provision of a local public goods. Another work by Caveliere (2001)(20) discussed how multiple Nash Equilibrium exists in a setting where the efficient numbers of players voluntarily contributing in local public good provision. Another interesting extension of Tiebout Model is the work by Flatters, et al.(29) They discussed how regions with different fiscal jurisdiction providing

public goods can achieve equilibrium and whether the equilibrium is pareto efficient. That work developed a setting where 2 regions with mobile migration attempt to achieve efficient allocation of public good.

Determining of local public good supply in one region is one of interesting issues attracts many scholars due to the condition where communities diverse in their level of public good provision, tax rates and local housing market condition (Calabrese, 2005)(22). Those factors became important to be considered in order to obtain their preferences, usually by voting mechanism applied to residents living in the community. Equilibrium is expected exist where according to Tiebout model, residents who live in the same community represent similar preferences.

3.4 Decentralized Provision of Local Public Goods

In this section we elaborate concepts on decentralization and its implications to local public good provision. Firstly we review Decentralization Theorem of Oates (Oates, 1972)(54) and further discuss welfare implication of the fiscal decentralization.

3.4.1 Fiscal Decentralization Theory

According to Oates (2006 pp. 2)(55), the current major role of fiscal decentralization in the public finance, has 4 (four) basic elements which are:

1. regional or local governments are in a position to adapt outputs of public services to the preferences and particular circumstances of their constituencies, as compared to a central solution which presumes that one size fits all

2. in a setting of mobile households, individuals can seek out jurisdictions that provide outputs well suited to their tastes, thereby increasing the potential gains from the decentralized provision of public services (Tiebout, 1956)

3. in contrast to the monopolist position of the central government, decentralized levels of government face competition from their neighbors; such competition constrains budgetary growth and provides pressures for the efficient provision of public services

4. decentralization may encourage experimentation and innovation as individual jurisdictions are free to adopt new approaches to public policy; in this way, decentralization can provide a valuable laboratory for fiscal experiments

In order to understand the problems now facing local governments, we firstly recall the Decentralization Theorem proposed by Oates (Oates, 1972), as follows:

> *The Decentralization Theorem: For a public goodthe consumption of which is defined over geographical subsets of the total population, and for which the costs of providing each level of output of the good in each jurisdiction are the same for the central or for the respective local governmentit will always be more efficient (or at at least as efficient) for local governments to provide the Pareto-efficient levels of output for their respective jurisdictions than for the central government to provide any specified and uniform level of output across all jurisdictions (p.35)*

The reasons behind the theorem above can be explained by raising question on why central government can't simply provide the efficient level of output for each jurisdictions. The answer to that question is because local governments are closer to their constotuencies, and they have knowledge of local preferences that the central government cannot easily obtain (Oates, 2006). Another reason is political constraint facing the central government, in which it is very difficult to treat each jurisdictions differently from political point of view.

In a formal way, let G be a vector of outputs of public goods, where an element g_i, is the level of public good in the i^th jurisdictions:

$$G = G(g_1, g_2, ..., g_n) \tag{3.2}$$

where comparing to centralized provision of local piblic goods we have a uniform level of public outputs across all jurisdictions that requires $g_i = g_j = g_0$ for all i, j.

3.4.2 Welfare Implication of Fiscal Decentralization

In the Decentralization Theorem, we can also find suggestion about how to generate welfare gain measurement from decentralized provision of public goods. Yoram Barzel (1969) (8)proposed an approach to provide a proof by maximizing the sum of consumer surpluses from provision of decentralized public goods (Oates 1972, pp.59-63), in which the approach can measure the welfare gain by calculating the difference between the level of aggregate surplus from both under decentralized and centralized provision of the good.

Oates (1997) in Oates (2006) proposed that under such conditions, the welfare gains depends on the variation in demand across jurisdictions and on the price elasticity of demand for the good. The greater the differences in the efficient levels of output across the jurisdictions themselves, the more there is to gain from allowing wach jurisdictions to provide its own efficient output level (Oates, 2006 p.13).

In order to obtain welfare gain among jurisdictions, it is important to develop an effective system that consist of the whole constellation of fiscal structure, the political system and market institutions. Effective system in the fiscal decentralization framework, requires supports from political and fiscal environment. This could lead to competition among decentralized authorities in which they will attempt to compete in providing local public goods and to combine it with the level of taxes to the property right. This concepts is the kind of reinforcement between markets and fiscal decentralization that influence the preformance of the private and public sectors in particular jurisdictions.

Combination of fiscal and market institutions could lead to generate the behavior of public decision maker to be more considering the promotion welfare of the constituencies and sustain the efficient performances of private markets in its jurisdictions. Such a balance condition lead us to the concept of efficient provision of local public goods.

3.5 Cooperation Between 2 local Governments

3.5.1 Motivation to Establish Cooperation Between Local Governments

In this section we begin to discuss the importance of cooperation between local government in local public good provision. We can start by raising a question of why the local government play important role in local public good provision and continue to why local governments are needed to cooperate each other in local public good provision.

One of the first attempts in studying issues in cooperation between local governments is the work by Marando (1968)(43). In his survey for inter-local cooperation in metropolitan Area-Detroit, he investigated that the economy may not the major determinant of some cooperation patterns. However, in the paper he proposed 4 basic purposes which one of them was questioning effectiveness of inter-local cooperation instead of self-provision as well as its contribution to solve major urban problems. In his research he conducted interview for public officials such as city managers, departments heads etc., and concluded that the cooperation can be an inadequate method in meeting many local needs as well as its contribution not to lessen independency of local governments which rejected previous hypotheses that it could lead to unification among local units of government.

In his survey on finding formal activity between municipalities, Marando (1964) found that there were two distinct kinds of formal cooperation which are the contract and the joint agreement. Under a contract, municipality desiring a service purchases it from another munici-

pality or some other form of local government while the joint agreement is formed when two or more local units of government formally join forces to provide a service (Marando, 1964).

Studies about cooperation in on public services provision among local governments emerge recently. Most of them come with conclusion where scale economies are the main factor to be considered by parties involved before cooperation establishes (Le Roux et al, 2005)(41). However many cases showed us that even though scale economy exists for the local facility provision, local governments do not cooperate on those matter. Le Roux and Carr (2007) conducted survey and categorized factors that motivated local government to cooperate. They propose at least 4 factors that could be considered, namely:

1. local economic factors
2. demographic characteristic of the local government
3. characteristic of the community
4. the influence of policy and planning networks.

In U.S, it is strongly motivated that local governments to establish cooperation by taking inter local government agreement as one form of cooperation, Zimmerman(1974)(98). Some studies emphasizes that fiscal stress is the main factor influencing local government in using interlocal agreement (Bartle and Swayze, 1997; Stein, 1990; Wood, 2006)(14)(70)(96). Other reason is level services such as the need to improve quality and extend the coverage service is also very important (Morgan and Hirlinger, 1991; Turmaier and Chen, 2005; Thurmaier and Wood, 2002)(47)(78)(79). For a more detail explanation see survey of Le Roux and Carr(2007).

In this fiscal pressure era, especially in a country where decentralization policy applied, local governments are challenged to play the role as the main provider of essential public services for example providing road, water, sewer etc., in urban area. Decentralization also contributes to the requirement for local government to become more independent as a consequence of reduction of state and provincial contribution of budget. Nevertheless, in transition from centralized to decentralized, some disputes or conflicts associated with ownership issues of local assets may emerge in one hand. On the other hand,local governments should find more creative ways in order to obtain such level of provision as well as efficiency formed by reducing cost. Broader issues such as environmental issues, infrastructure, water facilities and so on also may lead local governments to broaden their point of views and required what is so called collective action with other local government.

According to Sonenblum et.al. (1977),(74) local governments are expected to turn to interlocal agreements when they have insufficient resources to meet current service demand or to undertake necessary infrastructure improvements. In addition to that, Krueger and Mc Guire (2005) (38) propose that local governments experiencing fiscal stress or with high-need populations will be motivated to attempt to generate slack resources and cooperative agreements may provide a means to this end. High property tax also encourages local governments to cooperate each other as one way to reduce cost and in turn lead to reducing tax.

Another reason for local governments to cooperate is regional characteristics that influence service supply and demand. Morgan and Hirlinger (1991) (47) argued that local governments situated in metropolitan areas are more likely to use interlocal agreements due to large population and high density that could bring to cooperation.

3.5.2 Current Research on Cooperation Between 2 Local Governments in Public good Provision

The first survey on local public expenditure was the seminal work by Tiebout in 1956(77). His work was considered as the first influential paper that proposed how households in particular community choose the level of public good they preferred by deciding a region to reside. Tiebout's observation proposed that most public goods are mainly supplied in local level and result in transportation cost for consumers who enjoys the goods. The work was followed by Oates (1969)(53) who presented empirical findings on effects of local public budgets on the property values in the community based on assumptions in Tiebout model by incorporating how utility maximizing consumers choose a community with local public services level associated with their tax liability cost for property value. Local public good provision involving 2 regions usually deals with issues so called spillover when residents in particular region can also use other region facility. Besley and Coate (2002) discussed a political economic approach in cost allocation of local public goods when spillover occurs. Their discussion was based on Oates' Decentralization theorems states that without spillovers, a decentralized will be preferred (Oates, 1972). Discussion continued to how divided role between central government and local government could accomodate heterogeneity in taste of residents.

By using a viewpoint of profit maximizing communities, Sonstelie and Portney (1976)(58) also examined a model called a Tiebout-like model of how a consumer choose residential location and proved that a profit maximization normative criterion could lead to the efficient provision of public services and optimal community size. In the setting of two-region economy Akutagawa

and Mun (2005)(2) attempted to investigate the consequences of decentralized decision making by local government in provision as well as pricing local public good. They proposed two stages process in the setting where the first is how each local government decides whether to provide service or not, and later based on the decision made, user fee and taxes determinated. They developed model that dealt with possible patterns in attempt to find Nash Equilibrium.

Many researchers had paid attention to this issue with among others by Williams (1966)(93) who discuss how social optimum of local public goods provision can be attained in the system of local governments. He developed model on 2 local communities. Kuroda (1989)(39) also discussed local public good provision with spillover effects by extending model on optimal localtion of public facilities that previously discussed by Fujita (1986). In his paper, Kuroda investigated variables such as exogenous subsidies from central government for local public good provision, size of jurisdictions and location of public facilities that may influence the level of public good provision. Tsukahara (1995)(80) discussed provision of optimality of optional public facilities by considering residential choice behavior influenced by city size. The work of Cremer et al. (1997)(19) investigates investment pattern of indivisible local public goods with interjurisdictional spillovers where developed Nash equilibrium generates social optimum condition.

More current work by Kobayashi et. al. (2007) (37)discuss provision of local public goods among two neighboring regions where under coordinated condition some optimum Nash patterns could be attainable which is obtained where residents in both regions enjoy more variety of public goods provided by each local governments respectvely. They continued discussion by comparing social optimum condition of Nash Equilibrium with exogenous coordinated subsidy offered by central government requiring initial communication process of local governments.

Another research conducted by Pecorino (1999) (56), discussed relationship of cooperation in public good provision with the group size of contributors. He extended the work by Olson (1965)(51), a classic reference on that matter as well as the work by McGuire (1974)(48) and Chamberlin (1974)(23) analyzing the effects of group size on provision of of public goods where optimality of cooperation was adjusted as group size increases. In his work Pecorino applied repeated game framework to prove optimality of cooperation in increasing group size.

Discussion on sustainability of cooperation between local governments was also investigated by Cheikbossian and Sand-Zantman (2008)(26). In their paper, they conducted a research based on repeated game framework finding the incentives to cooperate in local public

good supply where local jurisdictions have repeated interactions among them. Comparative statics analysis showed that local governments should consider how to anticipate renegotiations among them as an effective attempt to continue cooperation process.

Our research focuses on how local governments committed to cooperate each other in local public good provision where possibility of cost allocation is possibel among the local governments. We conduct a theoretical research on cooperation between local governments in water supply system provision where the facility itself is categorized as network facility and spillover is zero. In addition to that, other tools for discriminatory pricing are still open to be discussed due to the behavior of local government who tend to maximize its resident welfare.

The novelty of our research can be identified in two folds. First, previous researches discussed how local governments involved in exogenous coordinated provision mainly originated from intervention from central government. Our research, on the other hand, discusses the possibility of cooperation initiatively resulted from agreement between local governments particularly concerning with difficulties in integrating municipalities water supply systems to improving economic efficiency. Another important thing is, it was apparent that previous researches mainly discussed on provision of discrete local public goods or even optional public goods where spillover exists. Our research, however mainly focus on specific local public goods which is water supply system. So far we found very limited literature discuss water supply system provision in a formal way especially in the field of public economics. Such condition has motivated us to conduct this research in attempt to fill in the room left.

3.6 Cost Allocation Rule in Cooperation Setting

It is interesting that historically theory on cost allocation by using cooperative game theory approach was initiated by scholars discussing cost allocation in water sector as basic frameworks. One of the well-known case is application of cooperative game theory to The Tennessee Valey Authority -US in 1930s. The goals of the project were to construct dams as well as reservoirs along Tennessee river with multi purposes namely to generate hydroelectric power, control flooding and navigation (Young, 1994)(97). Where there were some feasible possibility of cost function combination, cooperative game theory approach has been used for allocating the cost of multi-purpose reservoirs.

Young(1994) has conducted a general survey in order to explain the fundamental concept of cooperative game model which was applied to water sector. In general let N={1,2,...,n}

be a set of goods that can be provided jointly or severally by some agents. We denote c$\{i\}$ be the cost of providing i alone and for each subset $S \subseteq N$ we can let $c = \{S\}$ be the cost of provision the good in S. Where $c = \varnothing$. We called c as *cost-sharing game*. We denote a vector $\{x_1, ..., x_n\}$ such that $\sum x_i = c(N)$ where x_i is the amount charged to provide good i. Then we can arrange $\phi(c)$ as *cost allocation method* which is a unique allocation to every cost-sharing game.

Cost function can be considered as the feasible combination of activities made by the agents involved. When there are two disjoint subsets S' and S'' we can propose some properties as follows:

- subadditivity, if
$$c(S' \cup S'') \leq c(S') + c(S'') \tag{3.3}$$
- monotonic, if
$$c(S') \leq c(S'), forall S \subseteq S' \tag{3.4}$$
- cost-saving game, as the reason to choose seperate action rather than cooperation is to save cost, such a property should be considered
$$v\{S\} = \sum_{i \in S} c(i) - c(S) \tag{3.5}$$

3.7 Difficulties to Cooperation

According to Shrestha (2008) (71), the attempts of local governments in utilizing the supply of public services by involving othet local government can be considered as an exchange mechanism. An exchange mechanism is an institutional arrangement adepted by autonomous transacting actors to govern a transaction. By acting independently, many local governments are unable to deliver public services efficiently because of the externalities and economic of scale issues involving fragmented system of local governments, however Rainey (1991)(61) argued that purposive cities tend to move from independent production to cooperative (or interdependent) mode of service arrangements with other local government (Rainey, 1991).

As explained by Williamson (1991)(95), voluntary cooperation between local governments analogues to firms that enter into inter-firm allieance in a private economy (Shrestha, 2008). Similiar to the firm, locla governments can choose to do interlocal agreements, voluntary special districts, regional partnerships amd geographic consolidation with other authority. Figure 3.1below showed such forms of voluntary cooperation between local governments.

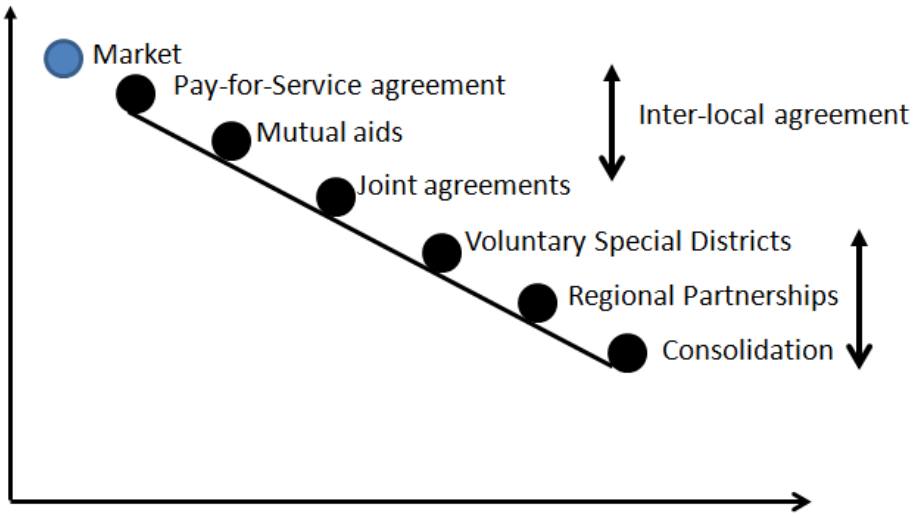


Figure 3.1: Forms of voluntary cooperation

Cooperation between local governments has reached its popularity since few decades ago (Kwon et.al., 2010)(40) because decentralization policy trend emerging in developing countries around the world. Implementation of intergovernmental cooperation has been adopted by many countries recently because such mechanism is considered easy to design and implement. Decentralization as a shifting mechanism from centralization force local governments to find opprtunities with another local government due their attempt to reduce cost of public goods provision. Coordination and cooperation are considered solutions for response to changing environments and fiscal conditions. However, Collins (2003)(28) asking based on his survey that eventhough cooperations has many benefits buat it is stil questionable why many local governments are facing difficulties to establish cooperations each others.

According to Feiock and Scholz (2010) (30), local governments, in attempts to establish cooperation with other local governments, are facing a collective action problem in the design and implementation of collaboration agreements in order to institutionalize cooperation. Further, Kwon et.al., (2010) summarized that to solve the fragmentation of interjurisdiction with interlocal agreements to cooperation, should be developd in two stages. At first stage, local governments are questioning whether they need and there is benefit of cooperations, and the next stage is whether they are requires to establish institution that functions to implement the service cooperation.

Drawing back to the history of institutional collective actions as the basic framework of interlocal government cooperation, we can highlight works by Scharps (1997) and Ostrom(1990,

2005) in which they proposed framework for institutional analysis development. The development of theories has been continued by incorporating institutional collective action to investigate interlocal agreements and grant coalition by among others Stein (1990) and Bickers, Stein and Post (2009). Others scholars also incorporated such concept to economic development through regional partnerships and regional management of natural resources (Schneider et al, 2003, Feiock et al., 2009). However, the basic assumptions as the Coase Theorem suggest that contracting can resolve externalities problems but opnly if transaction cost is low (Coase, 1937)(27).

Andrew (2007)(3), LeRoux and Carr; (2007)(41) and Post (2004) (60), suggests that potential cooperation between local governments is depending upon population, population density ang the scope of service provided (Kwon, 2010). Neverthelss, local governments are also demanded to guarantee efficiencies which are depend on regional income, fiscal conditins, and changes in service preferences that result from population change (Andrew, 2007).

Regarding difficulties to establish institution for cooperation among local governments, Williamson (1985)(94) argues that a firm is required to reduce transaction cost, which is also required for establishing institution for public goods provision. Another difficulty in cooperation is bargaining process that necessary to achieve agreements between local governments.

Problems on negotiating distribution of payoff as result from cooperation, can be an obstable. This process will be influenced by asymmetries in preferences and the relative political strengths of actors involved (Heckathorn et al., 1987). Pfeffer and Salancik (1978) highlighted that resource dependencies and population size also are important in facilitating cooperation as well as economic and demographic differences. Stronger partner in cooperation can push institutions to allocate the gains to itself (Steinacker, 2004).

However, in this research we will not conduct investigation regarding severe problems resulted from negotiating process between agents involved. Instead, we will focus on economics point of views which is efficiency of local public good provision. However, many researchers has conducted researches investigating such problems in which they dealt with issues such as citizens preferences, political cost etc., among them is Bickers et.al, (2010)(15).

3.8 Summary

This chapter investigates the basic concepts that have been discussed by researchers in many literatures concerning topics on local public good provision. We start from theory of public goods, club goods, local public goods as well as interlocal government cooperation in public good

provision. We have elaborated main literatures that most relevant to our research topics and discussed what kind of topics that many scolars have been interested in recently, particularly in the field of public economics. We had tried to focus on investigation for literatures that might support our hipothesis which is related to political jurisdiction issues among local governments in decentralized setting. One important issue is how to decide whether a local government to cooperate in local public good provision with its neighbor or remain independent and what factors influence such decision.

Previous researcher works has resulted in motivations to cooperate which are based on property values and scale economies issues. However, it is interesting whether cooperation could also consider issues such as fairness between local government involved. This issue motivates us to think deeper about components that should be considered in establishing cooperation between parties.

Two stages needed in establishing cooperation between local governments. First stage is considered as introspective stage where each local governments asks themselves whether the cooperation will benefit them or not. The second stage is establishing institutional arrangement of cooperation in which involving local governments engaged with the particular institutions. For instance, institution arrangement is needed to determine price or cost sharing in public facility provision.

In the next chapter we develop model settings based on our investigation in 2 regions, Bandung Regency and Cimahi City in West Jawa Indonesia. Both regions have an emerging issue on possibility of establishing interlocal cooperation in water supply system provision. Theoretical model is developed in order to show the current condition as well as problems both local government face on this matter in a formal way, then find solutions for such problem. We expect the result can be proposed policy implications as remedied to this issue in a form of recommendations for policy makers involved.

Chapter 4

The Model

4.1 Introduction

According to Rosenthal (2003)(62), existence of markets for piped water (and sanitation) services can be distinguished from conventional markets due to its difficulty to be served by more than one firm in same location or region. In terms of huge initial investment needed for establishing water distribution network and decreasing cost for additional consumer, it is very common globally to provide this public good by only one particular firm. In most of developing countries, this monopoly characteristic is one of the main roles of local government. Neverthless, in a setting of PDAM Tirta Raharja that involving 2 neighbors local governments, Bandung Regency and Cimahi City, we attempt to show whether cooperation in provision of such good efficient by considering cost allocation rule. Without water, no one can survive. Water is definitely essential for life. But water is not ubiquitous. Human being is seeking security of water availability in any age. Stable availability of clean water is still a great challenge in developing countries. The millennium development goals of UNDP (83) include halving the proportion of people without sustainable access to safe drinking water and basic sanitation by 2015. A number of reports have pointed out the inadequacy of water supply in urban areas, where poor households seldom have networked water supply access (84) (85)(86)(87)(88).

Difficulties concerning water availability come not only from nature and technology such as climate and geography but also from socio-economic reason such as financial availability, national administration system and so on. Moreover, those factors are usually interrelated and forming a complex system. In fact, difficulties concerning water supply attract academic attention from a variety of disciplines from engineering to social science including sociology, economics and political science. This implies that problems concerning water are complex and

requires a comprehensive consideration about the local uniqueness in terms of geography and socio-economic environment.

Our study is motivated by a problem that we observed in Bandung region in Indonesia where the operation of water supply system has been influenced by the decentralization policy in 2001. Decentralization promoted by the government of Indonesia has vested authority to determine substantial issues related to water supply system to local governments. A critical fact we observe there is that geographical territory of a local government's jurisdiction does not necessarily coincide with that of local water supply system. Theoretically, in other words, a closed system of water supply would cover multiple local governments' territories. According to the famous principle of fiscal principle developed by Olson(50), we have to have one layer of the government for each public good although it does not consider the individuals' mobility. Coverage of multiple local governments' jurisdiction means that decisions concerning the operation of water supply system attract their interests that may not be consistent with each other. A decision making process of water supply system should build in a coordination system that compromise interests of stakeholders.

Unfortunately, actual implementation of decentralization policy in Indonesia has not necessarily regarded the need of coordinating local governments' conflicting interests. As Nababan et al.(49) observed, there is a case that the authority of operating water supply system which covers multiple local governments' territories is monopolized by one local government among them as observed in Bandung region. The interest of our study is a problematic consequence of this 'partial authority allocation' from the economic point of view. The study aims at developing a descriptive model to explain the mechanism how the economic inefficiency arises from the partial authority allocation. In addition, we discuss feasible policies to overcome the identified problem.

The chapter is organized as follows. Section 2 describes the current institutional environment after decentralization in Bandung region in Indonesia, which motivates us to conduct this study. In section 3 and 4, a descriptive model is developed to analyze the economic efficiency under the current institutional environment. Section 3 analyzes the case of symmetric local governments, whereas section 4 analyzes the case of asymmetric local governments. As a result, we point out that the asymmetricity regarding the availability of water is a source of potential conflict of interest and leads to the economic inefficiency. In section 5, several feasible policies are proposed based on the implication of our analysis. Section 6 concludes the chapter.

4.2 Basic Idea

4.2.1 Institutional system of water supply system after decentralization in Bandung Region

Our study is motivated by the problem concerning with institutional consequence of decentralization in Indonesia in 2001 observed in Bandung region. In Indonesia, utility of water supply is provided by public enterprises called PDAM. PDAM is responsible for seeking and developing water source and facilities for water treatment and transmission. PDAM is completely government-subsidiary entities and hence controlled by local governments after the decentralization in 2001. Territory where a PDAM covers is not necessarily a single local government. Rather it is common that a PDAM covers multiple local governments' territories due to the geographical reason. This is the case in Bandung region. PDAM Tirta Raharja supplies water to Bandung Regency, West Bandung Regency and Cimahi City. Any deci-sion-makings of PDAM Tirta Raharja should attract the concerns of its coverage municipalities. However, the ownership of PDAM Tirta Raharja has been allocated only to Bandung Regency since decentralization was promoted, and West Bandung Regency and Cimahi city are excluded from the formal decision making process of PDAM Tirta Raharja. Cimahi City is originally recognized as a military area where a number of military facilities locate. However, Cimahi City has recently experienced population growth which leads to increasing demand of water for drinking and household use as well as commercial use. On the other hand, Bandung Regency which has 100% ownership of PDAM Tirta Raharja is rather sparsely populated and covers mountainous area. This implies that people in Bandung Regency is easier to acquire alternative water source other than PDAM compared to people in Cimahi City.

4.2.2 Problem Identification

The paper is partly motivated by a frustrated feeling of Cimahi City government. Due to the increase of population, they wish to expand networked water supply system. However, the Cimahi City government does not have a control over the PDAM Tirta Raharja. Intuitively, the investment for pipeline network in Cimahi City is inadequate. Our study aims at exploring a mechanism how under investment for the pipeline network in populated area under the current governance system of PDAM Tirta Raharja from the theoretical point of view. We focus upon the asymmetricity in geographical condition between Cimahi City and Bandung Regency, authority of PDAM Tirta Raharja. Cimahi City is steadily growing, but alternative water resources are

not rich compared to the surrounding mountainous areas including Bandung Regency. It is shown that the difference in richness of alternative water sources could be a critical factor that induces the underinvestment in Cimahi City. In addition, PDAM Tirta Raharja gains positive surplus from Cimahi City which is transferred for the investment into expanding the network in Bandung Regency, when the government of Bandung Regency behaves rationally.

Another source of the problem of partial authority allocation is rather a technical attribute. Pipeline is essential for connecting to water supply network. Without pipeline, people cannot use the networked water. This implies that the investment for pipeline is economically interpreted as purchasing a financial 'option' to use the networked water. The value of option is apparently depending on the availability of alternative water sources. A household with less alternative water sources may value option, i.e. pipeline higher compared to a household with more alternative sources. In summary, the purpose of the study is to prove theoretically that partial authority allocation could be problematic if there exists the difference in richness of alternative water sources and pipeline as an option

4.3 Model

4.3.1 Settings

The economy consists of two regions; Region 1 and Region 2. The population of two regions is symmetric and standardized as 1. Individuals of the economy are assumed to be immobile. PDAM is a corporation established to supply water. It is assumed that only the Region 1 government has authority to determine the price of water and investment for pipelines in two regions. This assumption reflects the partial ownership allocation of water supply system in Indonesia. The price of PDAM water cannot be discriminated between Region 1 and Region 2.

4.3.2 Technology

Costs of PDAM water supply system consists of two components: variable cost associated with the volume of supplied water and fixed cost associated with the initial investment which determines the capacity of water supply. The total cost of PDAM water supply system is formulated as

$$C(x_1, x_2, n_1, n_2) = c(x_1 + x_2) + c_f(n_1 + n_2) \tag{4.1}$$

x_i denotes the aggregate volume of supplied water for Region i and n_i denotes the number of households that have access to the pipeline network of PDAM. Hence, n_i is the maximum volume of water supply (i.e. capacity of water supply system) in Region i, i.e. $x_i \leq n_i$. Here n_i is called hereinafter 'network capacity'. A fixed cost of the investment for facilities such as water treatment plants that benefits both of Region 1 and Region 2 is not considered. For the simplicity of following analysis,

$$c = \frac{1}{1+k} \tag{4.2}$$

$$c_f = \frac{k}{1+k} \tag{4.3}$$

is assumed.

4.3.3 Demand

Households consume one unit of water. Households do not necessary use water supplied by PDAM exclusively. It is very common for the Indonesian to use private wells or community-based water supply system, which is hereinafter called as alternative water sources. Hence, households choose PDAM or the alternative water sources in consuming one unit of water. Here ρ is the cost of using alternative water sources which is distributed according to the cumulative distribution function $F_i(\rho) = a_i\rho$ in Region i, where $\rho \in [0, 1/a_i]$. Given the price of PDAM water p, a household whose cost of using alternative water sources is ρ chooses PDAM if $p \leq \rho$ and alternative water sources if $p > \rho$. The aggregate demand function of PDAM water without the capacity constraint, which is called as the potential aggregate demand hereinafter, is calculated as

$$\bar{x_i}(p) = 1 - F_i(p) = 1 - a_i p. \tag{4.4}$$

The inverse aggregate demand function is

$$\bar{P_i}(x_i) = \frac{1 - x_i}{a_i}. \tag{4.5}$$

The symbol ¯ denotes the demand is 'potential' and unconstrained by the capacity. When the capacity constraint is considered, a household may not obtain PDAM water even the price of PDAM water is cheaper than the cost of alternative water sources. If the potential aggregate demand exceeds the capacity, i.e. $\bar{x_i}(p) > n_i$, the capacity constraint is effective. in

other words $x_i(p) > n_i$ implies $\bar{P}_i(n_i) > p$. In this case, it is assumed that households with

$$\rho \leq \bar{P}_i(n_i) = \frac{1 - n_i}{a_i}$$

consume one unit of PDAM water. And households with $\rho < \bar{P}_i(n_i)$ use the alternative water sources. Hence, the 'real' aggregate demand function with the capacity constraint given p is

$$x_i(p, n_i) = \begin{cases} 1 - a_i p < n_i & \text{if } 1 - a_i p < n_i \\ n_i & \text{if } 1 - a_i p \geq n_i \end{cases} \tag{4.6}$$

$\bar{P}_i(n_i)$ is a threshold to determine whether the capacity is fully utilized or not depending on the setting of p. In other words, in order to fully utilize the capacity n_i, the price must be set less than $\bar{P}_i(n_i)$. In addition,

$$\bar{x_i}(c + c_f) = 1 - a_i(c + c_f) >> 0 \tag{4.7}$$

$\Leftrightarrow a_i >> 1$ for $i = 1, 2$

is assumed. This assumption guarantees that when the water is supplied at the price of minimum marginal cost, sufficiently enough aggregate demand exists.

4.3.4 Cost for water aquisition

The total cost of water acquisition in Region i is defined as

$$TC_i = px_i(p, n_i) + \int_0^{max[p, \bar{P}_i(n_i)]} \rho \mathrm{d}F_i(\rho) \tag{4.8}$$

The first term of RHS denotes the cost spent by households that use PDAM water and the second term denotes the cost for usage of alternative water sources. PDAM gains revenue from households using PDAM water for the in compensation for being responsible for water supply and network investment.

The revenue of PDAM coming from Region i is represented by

$$R_i = px_i(p, n_i)$$

as PDAM cannot differentiate the price in Region 1 and Region 2. The cost of supplying PDAM water for region i is

$$C_i = cx_i(p, n_i) + c_f n_i \tag{4.9}$$

For the analytical convenience, define

$$\theta_i = \frac{x_i(p, n_i)}{n_i} \tag{4.10}$$

that denotes the ratio of usage ratio against the capacity of pipeline. Here θ must be $0 \leq \theta \leq 1$. The cost of PDAM water supply C_i is written as

$$C_i = m_i n_i \text{ and } m_i = \frac{\sigma_i + k}{1 - k} \tag{4.11}$$

when $\sigma_i = \frac{1}{\theta_i} \geq 1$. Here m_i is regarded as the apparent marginal cost of water supply in Region i. Profit of PDAM is written as

$$\pi_i = R_i - C_i = (p - m_i)n_i \tag{4.12}$$

When the capacity of pipeline is fully utilized, the marginal cost is 1. However, if the capacity of pipeline is not fully utilized, the marginal cost is getting larger than 1 as θ_i decreases. The profit of PDAM is the sum of the profit from Region 1 and Region 2. That is,

$$\pi = \pi_1 + \pi_2 \tag{4.13}$$

The followings are some important properties on the total cost of water acquisition which are frequently used in the following analysis.

$$\frac{\partial TC_i}{\partial p} > 0 \tag{4.14}$$

$$\frac{\partial TC_i}{\partial p} = \begin{cases} < 0 & \text{if } p < \bar{P}_i(n_i) \\ \\ = 0 & \text{if } p \geq \bar{P}_i(n_i) \end{cases} \tag{4.15}$$

4.14 means that the total cost of water acquisition is always strictly increasing in the price of PDAM water. 4.15 means the expanding the supplying capacity contributes to decreasing the total cost when the capacity is constrained, but not when it not the case.

4.3.5 The case of impartial authority allocation

When the authority over the PDAM is impartially allocated, it concerns the welfare of Region 1 as well as Region 2, the price of PDAM water and the level of network capacity must be set to minimize the total cost of water acquisition in Region 1 and Region 2, which is formulated as follows.

$$\min_{p,n_1,n_2} TC_i + TC_2 \tag{4.16}$$

subject to

$$\pi_1 + \pi_2 = 0 \tag{4.17}$$

Solving the above problem, the following Lemma 1 is obtained.

Lemma 4.3.1 *When the authority over the PDAM is impartially allocated, the unit price of water and network capacity in Region 1 and Region 2 are set as follows (see the APPDENDIX for the proof).*

$$p^* = 1$$

$${n_1}^* = 1 - a_1$$

$${n_2}^* = 1 - a_2$$

In the process of proving 4.3.1, it is shown that the supplying capacities should be set to satisfy exactly the potential aggregate demand in each region. Redundant supplying capacity is always undesirable. Secondly, the zero profit constraint of PDAM requires the price to coincide with the marginal cost of water supply including two components of costs, i.e. c and c_f. In summary, when the authority over the PDAM is impartially allocated, the price of PDAM water is set at the level equivalent to the marginal cost of water supply. In addition, the supplying capacities in both regions cover the potential aggregate demand exactly.

4.3.6 The case of partial authority allocation

This subsection is for analysis of the case when the authority over the PDAM is partially allocated to the Region 1 and Region 2 has no influence on the PDAM's decision. The government of Region 1 is benevolent in the sense that it represents the welfare of people exclusively in Region 1, attempts to minimize the aggregate cost of households to acquire water in Region 1. PDAM is in principle a public corporation. Hence, price is set at the level of cost recovery basis, i.e. the profit of PDAM must be zero. Therefore, the price of PDAM water and network capacity in Region 1 and Region 2 are effectively set by the government of Region 1. The problem of the government in Region 1 is formulated as minimization of the total cost of water acquisition in Region 1

$$\min_{p,n_1,n_2} TC_1 \tag{4.18}$$

subject to 4.17

By solving the above optimization problem, the following 4.3.2 is derived (see the APPENDIX for the proof)

Proposition 4.3.2 *The government in Region 1 sets the price of PDAM water* $p = 1$ *and* $n_1 = 1 - a_1$. *Decision on* n_2 *does not have any influence on the welfare of Region 1 as long as it is* $n_2 \in [0, 1 - a_2]$.

No-discrimination policy of water price will provide the authoritative government an incentive to set the price at the efficient level under the above setting. However, in the absence of the fixed cost, the government of Region 1 has no interest on the welfare of Region 2. This implies that the degree of shared fixed asset between two regions, partial ownership of water supply system may cause disregard of outside their territory. However, providing the PDAM water at the marginal cost level in Region 2 does not conflict with pursuing the welfare in Region 1.

4.4 Fluctuated Demand

4.4.1 Assumption

The cost of using alternative water sources fluctuates depending on the season. In fact, private well and spring is easier to get short compared to river water which is the main source of PDAM. The previous section identified a principle that the supplying capacity has to fulfill the potential demand of PDAM water exactly. However, the supplying capacity is not variable depending on seasons. Therefore, the fluctuation of the potential demand for PDAM water makes it impossible to apply this 'fulfilling' principle. Hence, the supplying capacity will be redundant in some season, whereas it may be strictly binding constraint in other seasons. The aggregate demand for PDAM water in Region 1 is assumed to be

$$\begin{cases} \bar{x}_1^N(p) = 1 - a_1^N p & \text{normal season} \\ \bar{x}_1^D(p) = 1 - a_1^D p & \text{dry season} \end{cases} \tag{4.19}$$

i.e.,

$$F_1^j(\rho) = a_1^j \text{ (j=N,D)} \quad \text{where } a_1^N > a_1^D$$

For the simplicity of analysis, assume

$$a_1^D = a_2 = a \text{ and } a_1^N = \delta a \text{ where } \delta > 1.$$

The length of the dry season is denoted by γ and of the normal season $1 - \gamma$ where

$$0 \leq \gamma \leq 1$$

The price of PDAM water is constant through a whole year once it is determined. The government of Region 1 decides the price of PDAM water and the water supply capacity in two regions to minimize the total cost spent for water usage. The inverse demand function is also defined by the same manner as above.

$$\bar{P_1^j}(x_i) = \frac{1 - x_i}{a_1^j} \tag{4.20}$$

for $j = N, D$

$a_1^N > a_1^D$ implies $\bar{P_1^N}(n_1) < \bar{P_1^D}(n_1)$. Following the definition of 'real' aggregate demand function in Region 1 is

$$x_1^j(p, n_i) = \begin{cases} 1 - a_i^j p & \text{if } 1 - a_i^j p < n_1 \\ n_1 & \text{if } 1 - a_1^j p \geq n_1 \end{cases} \tag{4.21}$$

for $j = N, D$

It is assumed that

$$1 - a_1^N(c + c_f) \geq 0 \tag{4.22}$$

4.4.2 The cost of water acquisition and the profit of PDAM

The total cost of water acquisition in Region 1 is fluctuated by the seasonal change of the availability of alternative water sources. Then the total cost of water acquisition in Region 1 in each season is represented by

The cost of water acquisition in Region 1 is

$$TC_1^j = px_1^j(p, n_1) + \int_0^{max[p, \bar{P_1^j}(n_1)]} \rho \mathrm{d}F_1^j(\rho) \tag{4.23}$$

for $j = N, D$

Therefore, the total cost of water acquisition in Region 1 through a year is calculated as

$$TC_1 = \gamma TC_1^D + (1-\gamma)TC_1^N \tag{4.24}$$

On the other hand, the season-dependent cost for supplying PDAM water in Region 1 is

$$C_1^j = cx_1^j(p, n_1) + c_f \tag{4.25}$$

for $j = N, D$.

Therefore the cost for PDAM water through years is

$$C_1 = \gamma C_1^D + (1-\gamma)C_1^N \tag{4.26}$$

for $j = N, D$. For the analytical convenience, define

$$\theta_1^j = \frac{x_1^j(p, n_1)}{n_1} \tag{4.27}$$

that denotes the ratio of usage ratio against the capacity of pipeline. θ_1^j must be $0 \leq \theta_1^j \leq 1$. The cost of PDAM water supply C_i is written as

$$C_1 = m_1 n_1 \text{ and} \tag{4.28}$$

$$m_1 = \gamma m_1^D + (1-\gamma)m_1^N \tag{4.29}$$

$$m_1^j = \frac{\sigma_1^j + k}{1+k} \tag{4.30}$$

where $\sigma_1^j = \frac{1}{\theta_1^j} \geq 1$. m_1^j is regarded as the apparent marginal cost of water supply in Region i in season j. For the analytical convinience, define

$$M = 1 + \mu(m_1 - 1) \tag{4.31}$$

$$\mu = \frac{n_1}{n_1 + n_2} \tag{4.32}$$

Using the above notation, the total profit of PDAM is written as

$$\pi = (p - M)(n_1 + n_2) \tag{4.33}$$

M is regarded as the apparent marginal cost of water supply in total. M is dependent on the price, the supplying capacity and the ratio of seasonal length.

4.4.3 The case of impartial authority

By the same token in 4.3.5 the case of impartial authority requires the PDAM to minimize the sum of the total cost of water acquisition in Region 1 and Region 2. Hence the optimization problem is formulated as

$$\min_{p,n_1,n_2} TC_1 + TC_2 \tag{4.34}$$

subject to

$$\pi = 0 \tag{4.35}$$

For the simplicity of the analysis, assume $\delta a \approx 0$ and

$$\frac{1-\gamma}{\gamma} < (1+k)(\delta - 1) \tag{4.36}$$

Solving the above optimization problem, the following Lemma 4.4.1 can be obtained (see APPDENXI for the proof)

Lemma 4.4.1 *If the authority over PDAM is impartially allocated between Region 1 and Region 2, the price and the supplying capacity in each region is set as follows.*

$$p^{**} > 1$$

$$1 - \delta a p^{**} < n_1^{**} \leq 1 - a p^{**}$$

$$n_2^{**} = 1 - a p^{**}$$

4.36 is an assumption to guarantee that deviating the price from the marginal cost and extending the supplying capacity in Region 1 contributes to de-creasing the total cost. If PDAM supplies water at price equivalent to the marginal cost, due to the zero profit constraint, PDAM water is insufficiently supplied in the dry season due to the shortage of pipelines. In order to relax the shortage of pipeline in the dry season in Region 1, price has to be increased to meet the balance of PDAM accounting. On the other hand, increase in price reduces the usage of water in the normal season in Region 1 as well as in Region 2. In addition, expanded network is redundant in the normal season. Therefore, some households in Region 1 do not use PDAM

water in the normal season, hence no revenue from them to PDAM in the normal season. In fact, the profit coming from each region is

$$\pi_1 = (p = m_1)n_1 < 0 \tag{4.37}$$

$$\pi_2 = (p - m_2)n_2 = (p - 1)n_2 > 0 \tag{4.38}$$

It means that Region 2 pays more than the marginal cost, whereas Region 1 pays less than that. It is interpreted that the surplus is transferred from Region 2 to Region 1 for the redundancy in Region 1. The degree to what extent the surplus is transferred from Region 1 to Region 2 depends on the difference of availability of alternative water sources between in the dry season and the normal season, and the length of the dry season.

4.4.4 The case of partial authority allocation

When the authority over the PDAM is partially allocated to the government of Region 1, the PDAM pursues minimizing the total cost of water acquisition in a year. Keep the assumption 4.36

$$\min_{p,n_1,n_2} TC_1 \tag{4.39}$$

subject to 4.35.

Solving the above problem, the optimal choice of the Region 1 government is derived as shown in Proposition 2 (see the APPENDIX for the proof).

Proposition 4.4.2 *With the seasonal fluctuation of aggregate demand in Region 1, the price of PDAM water $p^{\circ\circ}$ and the supplying capacity in Region 1 and Region 2 $n_1^{\circ\circ}$,$n_2^{\circ\circ}$ satisfies*

$$p^{\circ\circ} > p^{**} \tag{4.40}$$

$$n_1^{\circ\circ} > n_1^{**} \tag{4.41}$$

$$n_2^{\circ\circ} = 1 - p^{\circ\circ} < n_2^{**} \tag{4.42}$$

Proposition 4.4.2 implies that the price under the partial authority allocation leads to higher price than the partial price and the supplying capacity in Region 1 is more whereas that in Region 2 is less compared to the case of impartial authority allocation. The partial authority allocation is preferable for Region 1, but not for Region 2. Increase in the price generates surplus more from Region 2. The surplus in Region 2 is spent for the expanding the network capacity in Region 1 which enables to decrease the cost of water acquisition in Region 1 in the dry season due to the supplying capacity constraint. Comparison of the case of partial authority allocation and impartial authority allocation tells us that the households in Region 2 are in a disadvantageous position. Firstly, Region 2 pays more than the cost spent for their PDAM water usage. Secondly, they could have enjoyed more usage of PDAM water if the price of PDAM water is served at the price on the cost recovery basis. The next section 4.5 discusses about the sources of that problem and suggestion of alternative policies to mitigate the problem.

4.5 Discussion

4.5.1 Externalities

The problem of partial authority allocation be-tween the regions is a matter of externalities arising from unique attributes of the case that we assume for depicting the institutional environment in the water supply system in Bandung region. Fundamental assumptions set in the above analysis are summarized as follows:

1. The supplier of the networked water covers multiple jurisdictions because of the geological reason and the profit of water supplier is constrained to be zero.

2. No discrimination of water price between the regions

3. Asymmetricity in the availability of alternative water sources between the regions

4. The seasonal fluctuation of the networked water source

The assumption 1) is related to the issue of water rights and the economy of scale technology. If each region has plenty of raw water sources and there is no economy of scale, there is no economic reason that a supplier of networked water covers multiple jurisdictions. Although our model does not assume the economy of scale and water rights setting explicitly, the supplier's coverage of multiple jurisdictions can be justified by the technical assumption 1). Assumption 2) is regarded as a political constraint rather than an economic constraint. Assumption 3) and 4) is

a necessary condition which generates a difference in the usage of supplying capacity between or among regions. The fluctuation regarding the availability of alternative water sources can make the redundancy of supplying capacity of pipeline. This is because pipelines cannot be adjusted to the volume of PDAM water usage. In this sense, an investment for pipelines is regarded as a fixed cost. Our primary motivation of the study is to identifying the problem of partial authority allocation over the PDAM, the organization of water supply in Bandung region. Remind the case there. PDAM Tirta Raharj covers areas of several jurisdictions including Bandung Regency, the monopolistic owner of the authority over it and Cimahi City. Region 1 in the model is regarded as Bandung Regency and Region 2 as Cimahi City. This difference is typically apparent between rural area (i.e. Bandung Regency) and urban area (i.e. Cimahi City). In Bandung Regency, with richer alternative water sources may not use the full supplying capacity of pipeline in the non-dry season. Partial allocation of authority over the PDAM with multiple jurisdictions generates externalities under the above settings. According to the analytical result in Section 4.3, the price set under the partial authority allocation is efficient and the supplying capacity in the Cimahi City with less alternative water sources does not matter with the welfare in rural area. However, the analytical result in Section 4.4 exhibits that introducing the fluctuated demand of PDAM water, hence the redundancy without the fluctuation of aggregate demand, is a source of externalities on Cimahi City. Bandung Regency less suffers from the increase of price than Cimahi City as the former has richer access to alternative water sources other than PDAM water. Rather the interest of Bandung Regency is expanding the supplying capacity which is constrained in the dry season. Therefore, Bandung Regency is tempted to expand the supplying capacity in their territory by increasing the revenue of PDAM. As the increase of PDAM water generates surplus from Cimahi City which can be utilized by Bandung Regency, Bandung Regency will use the surplus for expanding the supplying capacity in its own territory.

4.5.2 Policy Implication

Externalities can be overcome by an efficient negotiation according to the Coasian theorem9). It tells us that any externalities can be internalized by an efficient negotiation among stakeholders regardless of the initial allocation of ownerships or authorities. Therefore, according the Coasian theorem, Cimahi City may motivate to ask Bandung Regency to decrease the price of water and to expand the supplying capacity in Cimahi City by direct money transfer from Cimahi City to Bandung Regency. However, the Coasian theorem(21) concerns only with the economic efficiency and not with the fairness aspect. The fact that Cimahi City joins a

negotiation process with Bandung Regency itself implies that Cimahi City accepts the current regime of partial authority allocation over the PDAM. But people in Cimahi City will not accept such a negotiation to avoid accepting the partial authority allocation as an accomplished fact. Failure of efficient negotiation between Cimahi City and Bandung Regency implies the necessity of intervention of higher rank of authority like the provincial government and the national government. Although a governing system encompassing the provincial government is out of the scope of the study here, the above-identified problem will not be solved unless the provincial government aware of its own role in coordinating the interests of local governments such as Cities and Regencies.

4.6 Conclusion and Topics for Future Research

The partial authority allocation over the networked water facility system in Indonesia is a consequence of the decentralization policy in 2001. Our analysis shows that the partial authority allocation can be problematic when the regional asymmetricity regarding the availability of alternative water sources and the seasonal fluctuation exists. The price of the networked water is more expensive than the efficient level and the investment for pipelines in the urban area is insufficient, whereas that in the rural area is excessive. Hence, the insufficient penetration of PDAM water in the urban area is partly contributed by the current regime of partial allocation of authority over the PDAM. In addition, we have pointed out that negotiation for solving the problem will not work due to the political reason. This kind of partiality problem must be solved by higher rank of government system such as the provincial government and the central government.

How effective higher rank of government in resolving such problem and the mechanism incorporated to achieve the objectives could be topic for future research. The future research also could incorporate fairness issues resulted from negotiation process between local governments with the involvement of provincial or central government.

Chapter 5

Conclusions and Future Research

5.0.1 Conclusions

One of the global agenda in Millennium Development Goals (MDGs) is to achieve halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation (Target 7c). Data of current achievement shows that slow improvement in water supply system is due to the low development as well as investment in this sector especially in cities. Bird et.al (2008) in Ari (2011) emphasized that potential water crisis in Asian countries especially in developing countries may not because of natural water scarcity but rather because of inadequate or inappropriate water governance. After decentralization, local governments play more important role in water governance. However, transition from very centralized country to becoming decentralized tends to lead local governments to several challenges that related to budget issues, and the obligation to provide sufficient local public goods to its residents.

This condition has forced local governments to search for alternative source of infrastructure financing such as PPP. However, there is a potential to establish cooperation to other local governments that could lead to provide water supply provision in a more efficient way. This thesis aims to develop models that could explain that partial authority as one of condition of asymmetric ownership od water supply provision in decentralization, is an important factor that lead to inefficiency of water supply system provision. We develop model based on asymmetric ownership issues that emerging in Bandung Region in Indonesia, particularly involving Bandung Regency and Cimahi City local government.

As recently many Asian countries political paradigms have turned to decentralized system, including Indonesia, the role of local governments in promoting access to safe and clean water with improved piped water becomes very important particularly in urban areas.

However, transition process from centralized to decentralized has implied to emerging issues on local government capacities in providing local public goods. Lack of local budget, adaptation to new bureaucracy system as well as political process in local level, somehow, influence urban infrastructure improvement. For many local governments, for instance, PPP might be one option, however such issues on feasibility, and lack of water sources due to geographical condition has been emerging issues currently in terms of attracting new investors.

Our main focus in this research is associated with relationship between local governments. To illustrate such condition, let us take an example, where there is one local region who might have abundant water resources while its neighbor region suffers water scarcity. In this case, there is possibility to cooperate each other. Nevertheless, in spite of for the last few decades scholars has paid attention in the management of water supply system provision in metropolitan areas, only few research has been conducted on how local governments attempt to cooperate for water supply system provision. So that, in our research, we focus on how local governments establish cooperation in public good provision to achieve scale of economies, social welfare and efficiency. In addition to that, we listed emerging issues which are still needed to be discussed more between local governments such as cost allocation, joint production and the attempt to maximize their respective local resident utility.

In a brief manner, we summarize every chapter in this dissertation as follows.

Chapter 1 of this dissertation explains the background of the research, research objectives, rationale of the research as well as research methodologies used. In this chapter we explain our motivation to conduct this research, the results and findings, as well as the novelty of our research. Final subsection of the chapter describes the structure of dissertation.

Chapter 2 investigates the current condition of water supply system provision in Indonesia. We start from elaborating of water management and wate r policy in Indonesia and discuss implication of decentralization policy to water governance. We emphasize the role of local governments and issues related to fragmented jurisdiction, and inter jurisdictional provision of water supply system.

In order to develop a more understanding of current condition, we take a study case of water supply system provision in Bandung region, in which we explain more detail about access to clean water in Bandung Region and Cimahi City. Further we explain the profile of PDAM Tirta Raharja, in which we found that there is an asymmetric ownership issues in the management of the PDAM. As an attempt to formulate problem statements that explaining the phenomena, we also describe the result of interview that we conduct with several key persons

involved both from the PDAM Tirta Raharja side and Cimahi City side as well. Final section of chapter 2 discussed the concept cooperation between local governments, its benefits, challenges as well as the difficulties facing local governments to establish institution that deal with cooperation issues.

Chapter 3 describes basic theories that related to the research topic. We conduct literature review of works of researchers that mainly from the theoretical views of public economics and literature related to decentralization and governance. We emphasized literature related to theory of public goods which the basic of theories on local public goods provision. Further we investigates papers on implementation of decentralization policy in many countries, and discuss literature on inter jurisdictional cooperation such as interlocal government cooperation and its difficulties.

Many countries, especially developing countries, have turned to change their government system to decentralized. Many democratic countries believe that transfer authorities from central government to lower level of government as a means to gain efficiency in the governance process, and by generating more independent local government in terms of increase their capacity to treat their residents in more responsible ways. Nevertheless, local government, in the process to becoming more mature government, are facing a transition process, in terms of they have to be accustomed to condition where dependency to central government decreased. In terms of the lack of budget in infrastructure provision, nowadays local government should find ways of funding sources.

This condition has led to motivate us to propose establishing cooperation between local governments to achieve efficiency and reduce cost of public good provision for instance. In academic point of view, this research can be considered as one appropriate contribution for explaining water supply provision involving local governments in decentralization era where such framework can be adopt to be implemented in other similar setting.

Chapter 4, explains the process of developing the model. First, based on the previous chapters in where the current condition of water supply system provision explained, we developed the basic framework of the model. Difficulties concerning water availability come not only from nature and technology such as climate and geography but also from socio-economic reason such as financial availability, national administration system and so on. Moreover, those factors are usually interrelated and forming a complex system. In fact, difficulties concerning water supply attract academic attention from a variety of disciplines from engineering to social science including sociology, economics and political science. This implies that problems concerning

water are complex and requires a comprehensive consideration about the local uniqueness in terms of geography and socio-economic environment. Our study is motivated by a problem that we observed in Bandung region in Indonesia where the operation of water supply system has been influenced by the decentralization policy in 2001.

Decentralization promoted by the government of Indonesia has vested authority to determine substantial issues related to water supply system to local governments. A critical fact we observe there is that geographical territory of a local government's jurisdiction does not necessarily coincide with that of local water supply system. Theoretically, in other words, a closed system of water supply would cover multiple local governments' territories. According to the famous principle of fiscal principle developed by Olson(49), we have to have one layer of the government for each public good although it does not consider the individuals' mobility.

Coverage of multiple local governments' jurisdiction means that decisions concerning the operation of water supply system attract their interests that may not be consistent with each other. A decision making process of water supply system should build in a coordination system that compromise interests of stakeholders. Unfortunately, actual implementation of decentralization policy in Indonesia has not necessarily regarded the need of coordinating local governments' conflicting interests. As Nababan et al.(2012) observed, there is a case that the authority of operating water supply system which covers multiple local governments' territories is monopolized by one local government among them as observed in Bandung region. The interest of our study is a problematic consequence of this 'partial authority allocation' from the economic point of view. The study aims at developing a descriptive model to explain the mechanism how the economic inefficiency arises from the partial authority allocation. In addition, we discuss feasible policies to overcome the identified problem.

According to the clarification process that resulted from data collection and interview process, we formulated the problem and develop the basic model theoretically. In the model we emphasized cost for water acquisition between local governments especially incorporating the case comparison between of impartial and partial authority allocation.

Regarding the nature of condition of Indonesia, particularly Bandung region, we incorporate fluctuated demand issues of water supply system provision into our model and with the similar manner we show its implication to cost of water acquisition and the profit of PDAM, as well as comparison between impartial and partial authority allocation settings. Further we discuss the externalities that shown in the model and policy implication of the model to both Bandung Regency and Cimahi City. Final section of the chapter discusses the conclusion of the

model, its policy implication and the topics of future research related to possibility in extending the model in the future.

5.1 Topics for Future Research

Based on our findings in Chapter 2 and Chapter 4, we proposed several promising topics for future researches as follows:

1. Regarding the decentralization and water governance finding of the research, we found that after decentralization, water supply system provision in Indonesia has turned to be more complex. Local governments now are facing challenges that vary from nature and technological issues to socio-economic issues. It is apparent that decentralization of water management, cannot solve all water problems, however such decentralization efforts have improved the efficiency of water allocation in a number of countries. To understand how decentralization affects the efficiency of water allocation requires justification in a broader scope, for instance in national level. That could be a topic for future research.

2. Another topic is how to establish an institutionnal arrangement for resolving water scarcity to the local governments where developing PDAM is not sufficient for particular region. Some attempts have been conducted by local government, for instance by Bandung Regency to provide water in rural area, in the forms of communal water provision. Incorporating cooperation between local government and community group, could be a topic for future research.

3. In the case of PDAM Tirta Raharja ownership, the difficulty emerges is due to political constraints and conflict of interests among parties involved. We highlight that asymetric ownership issues could be one critical factor that result in inefficiency of water supply system provision in Bandung region. To resolve such a difficulty issues, a research investigating the process of agreement between local governments is needed. The future topic research might be involving attempts to incoorporate fairness issues on the agreement between local governments which is not incorporated in this research.

4. However, the Coasian theorem(21) concerns only with the economic efficiency and not with the fairness aspect. The fact that Cimahi City joins a negotiation process with Bandung Regency itself implies that Cimahi City accepts the current regime of partial authority

allocation over the PDAM. But people in Cimahi City will not accept such a negotiation to avoid accepting the partial authority allocation as an accomplished fact.

5. Failure of efficient negotiation between Cimahi City and Bandung Regency implies the necessity of intervention of higher rank of authority like the provincial government and the national government. Although a governing system encompassing the provincial government is out of the scope of the study here, the above-identified problem will not be solved unless the provincial government aware of its own role in coordinating the interests of local governments such as Cities and Regencies.

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Appendix A

Appendix 1

(Proof of Lemma 1)

Firstly, consider a point (p, n_1, n_2) that satisfies Equation 4.17 and $p > \bar{P}_i(n_i)$, i.e. the capacity is not constrained. In this case, cutting the supplying capacity does not change the total cost of water acquisition. Cutting the supplying capacity generates the surplus for PDAM which enables to decrease the price of water and to use the redundant supplying capacity since 4.14 holds. Therefore, any (p, n_1, n_2) which satisfies $p > \bar{P}_i(n_i)$ cannot be optimal. Secondly, a point (p, n_1, n_2) that satisfies 4.17 and $p \leq \bar{P}_i(n_i)$ or $m_i = 1$, i.e. the capacity is strictly constrained.

The zero profit constraint of PDAM 4.17 is written as

$$(p-1)(n_1+n_2) = 0 \tag{A.1}$$

When $n_1 + n_2 = 0$, the zero profit constraint requires $p = 1$. Then the problem is reformulated as the problem of optimizing the supplying capacity n_1 and n_2 for minimizing the total cost of water acquisition given $p = 1$ and $p > \bar{P}_i(n_i)$, where zero profit constraint always holds. If $\bar{P}_i(n_i) \geq 1$, the associated change of the total cost of water acquisition due to the small change in the supplying capacity is derived as

$$d(TC_1 + TC_2) = 1 - \bar{P}_1(n_1)dn_1 + 1 - \bar{P}_2(n_2)dn_2 \tag{A.2}$$

It is apparent that as long as $\bar{P}_1(n_1) \geq 1$ and $\bar{P}_2(n_2) \geq 1$, the small change in the supplying capacity contributes to reducing the total cost of water acquisition. In addition, $\bar{P}_2(n_2)$ is monotonically decreasing in the supplying capacity n_i. Therefore, the total cost of water acquisition is minimized when $\bar{P}_1(n_1) = 1$ and $\bar{P}_2(n_2) = 1$ holds.

(Proof of Proposition 1)

Only the difference between the problem of partial authority allocation and the impartial authority allocation is just the objective function. The logic of proof is fundamentally same as the one of Lemma 1

$$dTC_1 = 1 - \bar{P}_1(n_1)dn_1 \tag{A.3}$$

The minimizing the objective function, i.e. the total cost of water acquisition in Region 1 requires $\bar{P}_1(n_1) = 1$. However, the supplying capacity in Region 2 n_2 is not relevant to the objective of PDAM controlled by the government in Region 1.

(Proof of Lemma 2)

Firstly, consider a point (p, n_1, n_2) that satisfies 4.35 and $p > \bar{P_1^D}(n_1)$ and $p > \bar{P}_2(n_2)$, i.e. the capacity is not constrained in any seasons. In this case, cutting the supplying capacity does not change the total cost of water acquisition. Cutting the supplying capacity generates the surplus for PDAM which enables to decrease the price of water and to use the redundant supplying capacity since (15) holds. Therefore, any (p, n_1, n_2) which satisfies $p > \bar{P_1^D}(n_1)$ and $p > \bar{P}_2(n_2)$ cannot be optimal. Secondly, a point (p, n_1, n_2) that satisfies 4.35 and $p \leq \bar{P_1^N}(n_1)$ and $p < \bar{P}_2(n_2)$, i.e. the supplying capacity is constrained in any season. In this case, $m_1 = m_2 = 1$ holds and the zero profit constraint 4.35 is written as

$$(p - 1)(n_1 + n_2) = 0 \tag{A.4}$$

When $n_1 + n_2 \geq 0$, the zero profit constraint requires $p = 1$. Following the same logic used in the proof of Lemma 1, $\bar{P_1^N}(n_1) = 1$ and $\bar{P}_2(n_2) = 1$ holds.

Thirdly, a point (p, n_1, n_2) that satisfies 4.35 and $\bar{P_1^N}(n_1) \leq p \leq \bar{P_1^D}(n_1)$ and $p \leq \bar{P}_2(n_2)$, i.e. the supplying capacity is constrained in the dry season, but redundant in the normal season. In this case, $m_1 \leq 1$ holds.

$$pi = (p - M)(n_1 + n_2) \tag{A.5}$$

When $n_1 + n_2 \geq 0$, the zero profit constraint requires $p = M$. Contrary to the case of $p \leq \bar{P_1^N}(n_1)$ and $p \leq \bar{P}_2(n_2)$, expanding the supplying capacity is accompanied by the associated change in the apparent marginal cost M. Note the $m_1^D = 1$ and $m_1^D \leq 1$. The associated change in M due to the small change in supplying capacity n_1 is

$$\frac{\partial M}{\partial n_1} = \frac{\partial \mu}{\partial n_1}(m_1 - 1) + \mu \frac{\partial m_1}{\partial n_1}$$

$$\frac{\partial \mu}{\partial n_1} = \frac{n_2}{n_1 + n_2}^2 (> 0)$$

$$\frac{\partial m_1}{\partial n_1} = (1 - \gamma)\frac{\partial m_n^N}{\partial n_1}$$

$$\frac{\partial m_1^N}{\partial n_1} = \frac{1}{1 + k}\frac{\partial \sigma_1^N}{\partial n_1}$$

$$\frac{\partial \sigma_1^N}{\partial n_1} = \frac{1}{x_1^N(p, n_1)} > 0$$

Hence the small change in the supplying capacity always induces the increase of the apparent marginal cost M

$$\frac{\partial M}{\partial n_2} = \frac{\partial \mu}{\partial n_2}(m_1 - 1)$$

$$\frac{\partial \mu}{\partial n_2} = \frac{n_1}{(n_1 + n_2)^2} (< 0)$$

The small change of the price also induces the change of the apparent marginal cost

$$\frac{\partial M}{\partial p} = \mu \frac{\partial m_1}{\partial p} \tag{A.6}$$

$$\frac{\partial m_1}{\partial p} = (1 - \gamma)\frac{\partial m_1^N}{\partial p} \tag{A.7}$$

$$\frac{\partial m_1^N}{\partial p} = \frac{1}{1 + k}\frac{\partial \sigma_1^N}{\partial p} \tag{A.8}$$

$$\frac{\partial \sigma_1^N}{\partial p} = \frac{a_1^N}{[x_1^N(p, n_1)]^2} > 0 \tag{A.9}$$

Hence the small change in the price always induces the increase of apparent marginal cost M. In addition, the second-order of the marginal change of M due to the small change of p is

$$\frac{\partial^2 M}{\partial p^2} > 0 \tag{A.10}$$

As the price increases, the associated change of M becomes larger.

Consider the objective function. When $\bar{P_1^N}(n_1) \leq p \leq \bar{P_1^D}(n_1)$ holds,

$$TC_1^N = p\bar{x_1^N} + \int_0^p \rho dF_1^N(p) \tag{A.11}$$

$$TC_1^D = pn_1 + \int_0^{\bar{p_1^D}(n_1)} \rho dF_1^D(p) \tag{A.12}$$

Hence,

$$\frac{\partial TC_1^N}{\partial p} = \bar{x_1^N}(p), \ \frac{\partial TC_1^D}{\partial p} = n_1 \tag{A.13}$$

$$\frac{\partial TC_1^N}{\partial n_1} = 0, \ , \frac{\partial TC_1^D}{\partial n_1} = p - \bar{P_1^D}(n_1) \tag{A.14}$$

Total differentiation of objective function is

$$\frac{\partial TC_1}{\partial p} = (1-\gamma)\bar{x_1^N}(p) + \gamma n_1 \tag{A.15}$$

$$\frac{\partial TC_1}{\partial n_1} = (-\gamma)\bar{P_1^D}(n_1) - p), \ \frac{\partial TC_1}{\partial n_2} = 0 \tag{A.16}$$

$$\frac{\partial TC_2}{\partial p} = n_2 \tag{A.17}$$

$$\frac{\partial TC_2}{\partial n_1} = 0, \ \frac{\partial TC_2}{\partial n_2} = -(\bar{P_2}(n_2) - 1) \tag{A.18}$$

The Langrangian is defined as

$$\mathcal{L} = TC_1 + TC_2 - \lambda(p - M) \tag{A.19}$$

The first-order condition is

$$\frac{\partial \mathcal{L}}{\partial p} = \frac{\partial TC_1}{\partial p} + \frac{\partial TC_2}{\partial p} - \lambda(1 - \frac{\partial M}{\partial p} = 0 \tag{A.20}$$

$$\frac{\partial \mathcal{L}}{\partial n_1} = \frac{\partial TC_1}{\partial n_1} + \frac{\partial TC_2}{\partial n_1} + \lambda(\frac{\partial M}{\partial n_1} = \frac{\partial TC_1}{\partial n_1} + \lambda(\frac{\partial M}{\partial n_1}) = 0 \tag{A.21}$$

As

$$\frac{\partial \mathcal{L}}{\partial n_2} = \frac{\partial TC_1}{\partial n_2} + \frac{\partial TC_2}{\partial n_2} + \lambda(\frac{\partial M}{\partial n_2} = \frac{\partial TC_2}{\partial n_2} + \lambda(\frac{\partial M}{\partial n_2}) \leq 0 \tag{A.22}$$

is always satisfied, $p = \bar{P}_2(n_2)$ must hold.

Now consider the case that

$$p = 1, \bar{P_1^N}(n_1) = 1$$

and

$$\bar{P}_2(n_2) = 1,$$

i.e.

$$x_1^N(p, n_1) = n_1 = 1 - a_1^N,$$

$$x_2(p, n_2) = n_2 = 1 - a_2 \text{ and } m_1 = 1 \text{ holds .}$$

In that case,

$$\frac{\partial \mathcal{L}}{\partial p} = (1 - \delta a) + (1 - a) - \lambda(1 - \frac{\mu(1-\gamma)\delta a}{(1+k)(1-\delta a)^2}) \tag{A.23}$$

$$\frac{\partial \mathcal{L}}{\partial n_1} = -\gamma(\delta - 1) + \frac{\lambda\mu(1-\gamma)}{(1+k)(1-\delta a)} \tag{A.24}$$

When 4.36 holds, for λ which satisfies

$$\frac{\partial \mathcal{L}}{\partial p} = 0, \frac{\partial \mathcal{L}}{\partial n_1} < 0$$

It means that the increase of the supplying capacity and the increase the price decrease the total cost of water acquisition. Therefore, when the first-order condition

A.20 - A.22 is satisfied, $p^{**} > 1$, $\bar{P_1^N}(n_1) < p^{**} \leq \bar{P_1^D}(n_1)$ and $\bar{P}_2(n_2) = p^{**}$.

(Proof of Proposition 2)

The logic of the proof is basically same as that for Lemma 2. Again, $p > \bar{P_1^D}(n_1)$ and $p > \bar{P}_2(n_2)$ cannot be the optimal. When $p \leq \bar{P_1^N}(n_1)$ and $p \leq \bar{P}_2(n_2)$, the zero profit constraint requires $p = 1$. Then, $\bar{P_1^N}(n_1) = 1$ is optimal. But as in the Proposition 1, any $n_2 \in [0, 1 - a_2]$ is optimal. Thirdly, a point (p, n_1, n_2) that satisfies 4.35 and $\bar{P_1^N}(n_1) \leq p \leq \bar{P_1^D}(n_1)$ and $p \leq \bar{P}_2(n_2)$, the Lagrangian is written as

$$\mathcal{L} = TC_1 - \lambda(p - M) \tag{A.25}$$

Then the first order condition is

$$\frac{\partial \mathcal{L}}{\partial p} = \frac{\partial TC_1}{\partial p} - \lambda(1 - (\frac{\partial M}{\partial p})) = 0 \tag{A.26}$$

$$\frac{\partial \mathcal{L}}{\partial n_1} = \frac{\partial TC_1}{\partial n_1} + \lambda \frac{\partial M}{\partial n_1} = 0 \tag{A.27}$$

$$\frac{\partial \mathcal{L}}{\partial n_2} = \frac{\partial TC_1}{\partial n_2} + \lambda \frac{\partial M}{\partial n_2} < 0 \tag{A.28}$$

is always satisfied for any $\lambda > 0$, $p = \bar{P}_2(n_2)$ holds. Comparing A.20 and A.27, the difference in the first-order condition between the case of partial authority allocation and that of impartial authority allocation is the exclusion of the effect of the price change on the total cost of water acquisition in Region 2, i.e.

$$\frac{\partial TC_2}{\partial p}.$$

As

$$\frac{\partial TC_2}{\partial p} > 0$$

is holds, the optimal price $p^{\circ\circ}$ is always larger than the optimal price under the case of impartial allocation p^{**}.

Appendix B

Appendix 2

This appendix refers to the local news of Bandung Region. First news explain the issues emerging about the profit sharing issues of PDAM Tirta Raharja. One of region representatives of Bandung Barat Regency was complaining about the progress of MoU between 3 regions which are Bandung Regency, Cimahi City and Bandung Barat Regency, has been signed by all the Regents and Mayor of the regions. However, agreement on the content of MoU which is involving profit sharing mechanism was allegedly lacked, even though it was facilitated by officer from Provincial Governance. The progress also was said too slow and would be expired soon.

> Source: http://m.inilah.com/read/detail/1803901/kbb-ancam-tutup-sumber-air-pdam-tirta-rahardja Accessed: 4 December 2011 Minggu, 4 Desember 2011, 22:11 WIB INILAH.COM, Bandung - DPRD Kabupaten Bandung Barat (KBB) mengancam akan menutup sumber air PDAM Tirta Rahardja. Pasalnya, perusahaan daerah tersebut mengambil air baku dari lokasi yang letaknya masuk wilayah KBB. Sebanyak delapan sumber mata air yang dikelola PDAM itu berada di wilayah KBB. Kalau tidak ada niatan baik dari kabupaten induk, kita akan menutup sejumlah sumber air baku mereka," kata Wakil Ketua DPRD KBB Iwan Setiawan, Minggu (4/12/2011).
>
> Menurutnya, nota kesepahaman atau memorandum of understanding (MoU) memang sudah diteken tiga kepala daerah 2010 lalu. Yakni, antara Kabupaten Bandung, Kota Cimahi, dan KBB. Namun, perjanjian kerja sama (PKS) yang merupakan inti dari profit sharing atau pembagian keuntungan itu hingga kini belum mencapai kesepakatan. Dia menegaskan, kalau pun MoU itu habis masa berlakunya itu bisa diperpanjang waktunya dalam adendum.
>
> "MoU itu kan bisa diperpanjang, pembahasannya juga masih dalam proses. Kabupaten Bandung sebaiknya jangan memvonis secara sepihak bahwa KBB tidak dapat pembagian keuntungan PDAM Tirta Rahardja," ujar Iwan.
>
> Senada dengan hal itu, Ketua Komisi B Imam Tunggara mengatakan sejauh ini proses pembahasan itu masih dalam penjajakan. Tahapan itu, kata dia, melibatkan Biro Hukum Pemprov Jabar sebagai mediator. Dia menjelaskan, hingga saat ini PKS itu masih dalam tahap pembuatan draf.

> "Berdasarkan perhitungan konsultan, diperkirakan KBB mendapat Rp300 juta/-tahun dari profit sharing itu. Angka itu sudah diperhitungkan karena KBB memiliki sumber air baku. Jika dipersentasekan, angka itu sebesar 9,9% dari keseluruhan laba," ujarnya seraya mengakui jumlah itu lebih besar dari keuntungan yang diperoleh Kota Cimahi. Selain kepemilikan sumber air baku, pertimbangan lainnya yaitu jumlah pelanggan di KBB yang jumlahnya signifikan.
>
> Dari keterangan yang dihimpun, Untuk jumlah pelanggan itu rinciannya adalah di Kabupaten Bandung terhitung sebanyak 28.850 pelanggan. Sedangkan, untuk Kota Cimahi terdapat 11.983 pelanggan dan KBB sebanyak 10.498.
>
> Sebelumnya, DPRD Kabupaten Bandung menyatakan KBB tidak berhak atas pembagian keuntungan tersebut. Hal ini menimbulkan reaksi dari Pemkab dan DPRD KBB yang merasa berhak atas bagi hasil laba PDAM Tirta Rahardja.[jul]

Another news is discussing the difficulty to obtain clean water in dry season in Bandung region, a case of households in Bandung Timur (East Bandung) when they were forced to buy clean water from water vendor even though its price in dry season increased dramatically almost 100%. Everyday one household needs at least 20 jerry cans clean water that used for daily life. However due to the dry season, the household' private well was empty and forced the households to buy water from the street vendor. Everyday the households should spend Rp 60,000 or ¥600 for buying water. In normal season, the vendor said, households usually only buy water, in average only 2-3 jerry cans, for drinking or cooking because they can rely on their private well to other daily life purposes. However, in the dry season, most of households buy more water , 5-10 jerry cans per day in average, because their private well runs dry. The increasing demand in dry season leads to increasing price up to 100% comparing to normal season.

> Soource: http://poskota.co.id/berita-terkini/2011/09/17/harga-air-di-bandung-naik-dua-kali-lipat Accessed: 17 September 2011, BANDUNG (Pos Kota)Ratusan ibu rumah tangga di kota Bandung menjerit menyusul harga air pegunungan di musim kemarau ini mendadak naik 100 persen. Semula harga air Rp 1.500/jerigen kini merangsek naik Rp 3000/jerigen. Kenaikan harga air, diduga akibat kemarau yang semakin mencekam, ditambah sejumlah sumber mata air di daerah Bandung Timur kini sudah mulai mengecil. 'Kami kaget harga air mendadak naik di musim kemarau ini. Kenaikan cukup besar hampir 100 persen,' komentar sejumlah ibu rumah tangga, Sabtu. Yuli,45, salah seorang ibu rumah tangga di Perumahan Riung Bandung, Bandung menjelaskan, dengan adanya kenaikan harga air pegunungan membuat dirinya mulai stres. Pasalnya, per hari paling sedikit keluarganya membutuhkan air 20 jerigen. Air itu digunakan untuk memasak, mencuci, dan mengisi bak mandi. Terkadang, jika ada tamu kebutuhan air itu pun bertambah menjadi 30 jerigen per harinya. Kami sudah tak bisa berbuat apa-apa karena sumber air artesis di rumah sudah berhenti gara-gara kemarau ini. Padahal, kedalaman sumber artesis sudah ditambah tapi air tetap bermasalah jika kemarau panjang,". Dengan adanya kemarau yang kian panas, dia terpaksa harus mengalokasikan dana untuk air Rp 60

ribu per hari untuk membeli air jerigen yang biasa dijual pedagang secara keliling. Dia, bersyukur meski sumur di rumah sudah kekeringan, tapi masih mudah mendapatkan pedagang air keliling di wilayah Bandung Timur. Olehkarenanya, Yuli berharap kemarau akan segera berlalu, dan Bandung akan segera diguyur hujan supaya sumur-sumur di perumahan akan lancar kembali. Salah seorangh pedagang air keliling di Bandung Timur, Ade,35, mengakui kemarau ini jumlah konsumen air mendadak meningkat. Tak sedikit ibu rumah tangga yang biasa memesan air hanya 2-3 jerigen, kini mendadak naik menjadi 5-10 jerigen. Hal ini terjadi, akibat banyak sumur di rumah-rumah warga dan di perumahan-perumahan yang sudah mengering. Permintaan cukup tinggi, kami terkadang jualan dari biasanya hanya dua kali, kini mendadak menjadi 7 kali karena kasihan banyak yang memesan. Harganya naik 100 persen menyusul air itu pun mulai sulit dari sumbernya.(dono/b)

Appendix C

Appendix 3

This appendix refers to the report of LM-FE, Universitas Padjadjaran, (2008), *Piloting Model for Collaboration among PDAMs in West Java for Improved Water Management Project*. For more detail information, interested readers may consult LM-FE Unpad (2008)(89)

C.1 Issues on Improvement of PDAM Tirta Raharja

C.1.1 Performance Issues

PDAM Bandung Regency operated with the onboard capacity 746 liters/second in 2007. During the 2005-2007 periods, that onboard capacity was used around 79.8 % per year. With the main water resource are took from natural spring water and the surface water resources (river). The total loss water was counted based on total water production subtracted with total water sold and divided with the water production total. In 2005-2007, the rate of water loss is increase 0.1%. These things happen because the water sold total decrease is larger than the water production total decrease in the same period, just like what happen in Bandung regencys PDAM.

Even the water sold had been decreased in 2005-2007, the costumers / extension number is growing, amounts average 2.7% per year. Like other PDAM some of the costumers are household group. Meanwhile the commerce and industrial costumer is only 2.9% from the total costumer.

During 2005-2007 period, the number of costumers/extension decrease 0.4% on the average each year. The biggest descent come from social costumer and followed with

the industrial costumers and commerce costumers, amounts 24.9%, 8.7%, and 2.9% each. Meanwhile, the household costumers only grow for 1.7% per year. The special costumers have the biggest growth, on the average 80.4% per year. Some of the water sold, around 87.2% are consumed by the household costumer. Meanwhile, the industrial costumer consumed around 2.9% of the water sold, smaller than the social costumer consumed and special costumer, social consumer consumed 3.9% and special costumer consumed 6.0% during the 2005-2007 periods.

The consumption of water per costumer is 16 m^3, around 91.1% from the total operational income came from water sales and the rest 8.4% come from non water sales, for example, new extension income, re-connect income, and also fine income that counted 0.5% from the total operational income. The largest portion of water sales, come from the household costumers, and industrial costumers with each contribution number 83.3% and 14.5% from the water sales total. On the other hand, water sales from industrial costumers and special costumers have the largest growth, around 175.5% and 63.0% during 2005-2007. Meanwhile the water sales for household costumers, commerce costumers, and social costumers grow 0.1%, 1.9%, 23.2% each at the same period.

C.1.2 Financial Issues

PDAM Bandung regency average fare, was counted base on water sales divided to water sold number. Meanwhile average cost counted from total operational cost (cash operational cost add to depreciation cost and interest cost) divided to total water sold. Average cost grows 9.2% per year during 2005-2007. Now the average fare grows a bit better, 12.55, in the same period.

However, just like the operational ratio represent, an average fare only able to fill 98.4% from the average cost that PDAM Bandung Regency issued. Meanwhile, based on the 2nd/1998 domestic government ordinance there are three kind of fare category, which are:

1. Low fare cost, included cash operational and maintenance cost including employment cost and public administration cost.

2. Base fare cost, included low fare cost add to payable payment (prime and interest).

3. Complete fare cost, included low fare cost add to depreciation and 10% rate of return

from the evaluated assets book price.

PDAM Bandung Regency drinking water sector funding is procurable from many sources, which are:

1. Central government: accumulated drink water infrastructure project value. From West Java PPSAB project, Ditjen Cipta Karya project, and others till 2006, amounts Rp. 25,815,380,331,-

2. Local Assets that separated till 2006, amounts Rp. 12,467,668,649,-

3. Donation from developer and Soreangs National Housing authority, amounts Rp. 3,512,978,988,-

4. Domestic payable (RDA/DDI) as loan resumption (SLA) from Center Government, 2006 residue, amounts Rp. 1,750,575,715,-

5. International payable (RDA/DDI) as a loan resumption (SLA) from center government from Bandung regencys PDAM project, December 31st 2006 loan residue, amounts Rp. 14,865,154,345,-

Appendix D

Appendix 4

We found that there are at least 10 Laws, 11 Government regulations, 3 Presidential Decrees, and 16 Ministry decrees that regulate water supply system provision in Indonesia. In addition to that, every region also has its local regulations enacted by local authorithy (Governors, Regents and Mayors).

The below list only highlights most important Law/Regulations that closely related to governance of water supply system provision in Indonesia.

1. Law No. 7 /2004 on Water Resource Sumber Daya Air
2. Law No. 25/2004 on National Development Planning System
3. Law No. 32/2004 on Regional Governance
4. Law No. 33/2004 on Balancing Fiscal between Central Government and Regional Government
5. Law No. 17/2007 on Long Term national Development Plan 2005-2025
6. Law No. 26/2007 on Spatial Plan
7. Law No. 32/2009 on Environment Protection and Management
8. Law No. 36/2009 on Health
9. Law No. 1/2011 on Housing and Settlement Area
10. Government Regulation No. 16/2004 on Water Supply System Development
11. Government Regulation No. 58/2005 on Regional Fiscal Management

12. Government Regulation No. 65/2005 on Minimum Service Standard

13. Government Regulation No. 38/2007 on Government Role Sharing between Central Government, Provincial Government and Regional Government (Regents/Cities)